THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXVI. No. 653.] LONDON, NOVEMBER 16, 1875. [27TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—10,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
DO. GARESFIELD COKE.

RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1828. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubit Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
AND
SPECIAL GASOMETER PAINT
(Mixed ready for use).
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
STEVENS & CO.,
(SUCCESSORS TO SAMUEL CALLEY. ESTABLISHED 20 YEARS.)
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WORKS: BRIXHAM, TORBAY.

PROUD'S
SPECIALITIES IN WOOD GRIDS
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
SCRUBBERS FITTED WITH MR. LIVESEY'S BOARDS AT MODERATE COST.
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103, ICKNIELD STREET EAST, BIRMINGHAM.

COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
COWEN'S GARESFIELD COALS.
Coal Office,
QUAY SIDE, NEWCASTLE-ON-TYNE.
JOS. COWEN & Co. are the only Manufacturers of FIRE-BRICKS and CLAY RETORTS at BLAYDON BURN.

JOHN RUSSELL AND CO.,
THE WEDNESBURY TUBE-WORKS, WEDNESBURY;
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
69, UPPER THAMES STREET;
COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE, } LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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MANUFACTURERS OF
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OF
FIRST-CLASS MATERIALS & WORKMANSHIP;
Also, STATION-METERS, PRESSURE-GAUGES, STREET-LAMPS, REGULATORS, &c.
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Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
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RETORTS SET, AND GUARANTEED TO BURN OFF A CERTAIN AMOUNT OF COAL, OR ELSE NO MONEY TAKEN FOR THE CONTRACT.
PLANS ON APPLICATION.
Retort-Setters sent to all parts of Europe and America.
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LONDON, 1862. CLASS X.
LONDON, 1862. CLASS XXXI.
PARIS, 1867. SILVER MEDAL.
AMSTERDAM, 1869.
DIPLOMA D'EXCELLENCE.
VIENNA, 1873. THE ONLY MEDAL.
MANCHESTER, 1875. SILVER MEDAL

GEORGE GLOVER & CO.,
MANUFACTURERS OF
IMPROVED DRY GAS-METERS,
WARRANTED TO MEASURE CORRECTLY, AND NOT TO VARY.

EXTENSION OF PREMISES.
G. G. & Co. having had their premises entirely rebuilt, are now fairly in possession of large and commodious workshops, specially adapted to the requirements of the trade, and they are prepared to execute orders, large or small, with promptness and despatch.

THEY KEEP IN STOCK METERS OF ALL SIZES, UP TO 300 LIGHTS.

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236, GEORGE STREET, GLASGOW; and 30, LANCASTER AVENUE, MANCHESTER.
AGENT FOR AUSTRALIA:
Mr. A. DEMPSTER, POST-OFFICE PLACE, MELBOURNE.
G. G. & Co. have just been awarded a SILVER MEDAL for Gas-Meters and Gas Apparatus at the Exhibition of the "Society for the Promotion of Scientific Industry," Manchester.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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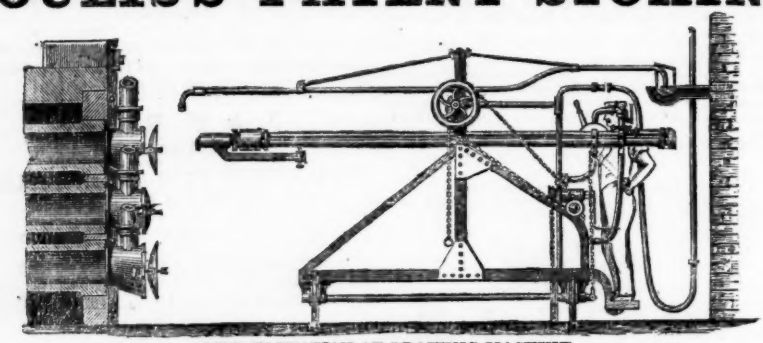
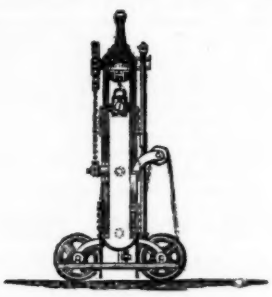
FOULIS'S PATENT STOKING MACHINE.



SIDE ELEVATION OF DRAWING MACHINE.



END ELEVATION.

(The Charging Machine will be Illustrated in next week's Advertisement.)

Makers: TANGYE BROTHERS and HOLMAN, London and Birmingham; ADAM WOODWARD and SON, Manchester ROBERT LAIDLAW and SON, Glasgow; MASCHINENBAU-ACTIEN-GESELLSCHAFT HUMBOLDT, Kalk bei Deutz; Or all particulars may be had from JAMES WOTHERSPOON, 31, St. Vincent Place, Glasgow.

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WORTLEY FIRE-BRICK WORKS,

NEAR LEEDS,

MANUFACTURERS OF ALL DESCRIPTIONS OF

FIRE GOODS, and Salt-Glazed Drain-Pipes.

LONDON WHARF:

Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;

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Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

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THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

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ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

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TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

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GAS-FITTERS TOOLS, VALVES, COCKS, &c.

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PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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LIMITED,

FALCON STREET, OLDHAM,

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THE FARNLEY IRON COMPANY, LIMITED,

FARNLEY, near LEEDS,

MANUFACTURERS OF

FIRE-CLAY GAS-RETORTS & FIRE-BRICKS,

Of every size and shape, and of the best quality; also of White and Coloured GLAZED BRICKS, SANITARY PIPES, &c., &c.

The F. I. Co. have the exclusive right to make and sell Fraser's Patent "Ribbed" Gas-Retorts in Fire-Clay.

In order to meet the constantly increasing demand for their Gas-Retorts, the F. I. Co. have recently made such an addition to their premises as will enable them to execute expeditiously the largest home or foreign orders.

Apply as above, or to the London Offices, 15, NEW BROAD STREET, E.C.

SIDNEY LEONI & CO.,

GAS ENGINEERS,

Patentees and Manufacturers of Registered Apparatus for Cooking and Heating by Gas, Complete Kitcheners for Families, Hotels, Clubs, &c. Ovens for Baking and Roasting. Grillers for Broiling. Boilers and Steamers for general use. The New Patent Tubular Safety Gas Boiler; also Heating and Ventilating Stoves, besides other Culinary and Warming Apparatus of their invention, and for which they have been awarded Prize Medals in 1871, 1872, 1873, and 1874.

They have also just been awarded by the Jurors of "The Exhibition of Appliances for the Economy of Labour," now being held at Manchester, the

GOLD MEDAL

For their collection of Patent Atmospheric Gas Apparatus, comprising New Patent Kitcheners for Roasting, Baking, &c., Steamers, Bath Boilers, Heating and Ventilating Stoves, Ornamental Drawing and Dining-room Fire Grates, and other Gas Apparatus, for their novelty, design, workmanship, and utility.

For Pamphlets on the "Advantages of Cooking and Heating by Gas," and Price Lists, &c., apply at the

Adamas Works, 54 to 66, ST. PAUL'S ST., NEW NORTH RD., LONDON, N.

London Depot: 74, STRAND, ADELPHI, W.C.,

Sole Licensees and Agents in Great Britain for

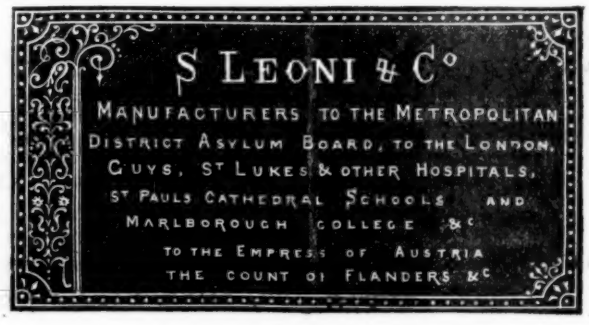
GIROUD'S PATENT RHEOMETER.

This Instrument is easily fixed under any burner; it regulates the volume of gas to be consumed, notwithstanding the size of the burner or the variations of pressure.

PRIZE MEDALS, 1862, 1867, 1871, 1874, 1875.

SOLE AGENTS and MANUFACTURERS of LOOKER'S PATENT WARMING and VENTILATING GAS-STOVES.

(Special Illustrations and Prices on application to our Works.)


S LEONI & Co
MANUFACTURERS TO THE METROPOLITAN
DISTRICT ASYLUM BOARD, TO THE LONDON,
GUYS, ST LUKES & OTHER HOSPITALS,
ST PAULS CATHEDRAL SCHOOLS AND
MARLBOROUGH COLLEGE &c
TO THE EMPRESS OF AUSTRIA
THE COUNT OF FLANDERS &c

THE

IMPERIAL METER COMPANY,

LIMITED,

KING'S ROAD, LONDON, N.W.,

OFFICE: 9, VICTORIA CHAMBERS, WESTMINSTER, S.W.,

MANUFACTURERS OF

"WET" & "DRY" GAS-METERS IN IRON & TIN-PLATE CASES,

STATION-METERS AND GOVERNORS, STREET-LAMP METERS, BOXES, AND REGULATORS FOR THE AVERAGE METER SYSTEM.

TO GAS COMPANIES, ENGINEERS, &c.

These Works are in full operation, and it will be the aim of the New Company not only to keep up the excellent workmanship of their predecessors, but, by the introduction of special machinery, to manufacture **Meters of a higher standard than is usually given, without increasing the cost.**

Special attention is invited to the Compensating Wet Gas-Meter of De Castro and Burton, which is now becoming so generally adopted, and is more simple in construction than any other Compensating or Ordinary Wet Meter. There is but one centre of friction to be overcome by the gas. By its self-adjusting principle it maintains an unvarying water-line; and the reservoir contains sufficient water to supply the Meter for twelve months without attention. It is unaffected by "tilting," and cannot be "flooded" by any pressure.

The Company also manufacture Dry Meters upon the most improved principle, and all their Meters being made to standard gauges, the most accurate measurement is obtained.

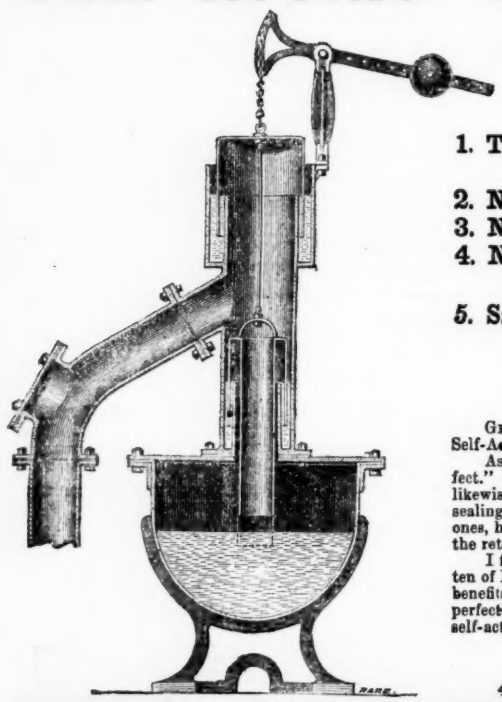
Attention is also called to their Dry Meters in Wood Cases, as used by some of the London Gas Companies. These Cases are a great preservation to Tin-plate Meters, especially in seaport towns, where the air is impregnated with salt; they are also particularly suited for export.

The Company repair or convert every description of Wet Gas-Meters to De Castro and Burton's Patent.

SELF-ACTING REMOVABLE DIP-PIPE,

PATENTED BY

CHANDLER & STEVENSON.



ADVANTAGES.

1. There is no pressure on the Retorts.
2. No deposit of Carbon.
3. No scurfing is required.
4. Never a choked Ascension-Pipe.
5. Saves Fuel and Wear and Tear.
6. Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7. Is never out of order.
8. Requires no attention.
9. Is perfectly automatic in its action.

TESTIMONIAL.

Metropolitan District Asylum, Caterham, Surrey, Dec. 14, 1874.

MESSRS. CHANDLER AND STEVENSON.

GENTLEMEN,—I have much pleasure in bearing testimony to the complete working of your "Patent Self-Acting Dip-Pipes," which have now been in constant operation over three months.

As regards the action of the apparatus, I can describe it no better than by calling it "simply perfect." Immediately the retort is charged and the lid secured, the small holder rises, which lifts the Dip; likewise the instant the gas is permitted to escape at the mouthpiece the holder falls, thus perfectly sealing the Dip. I am fully convinced of the superiority of these Self-Acting Dips over Non Self-Acting ones, having experienced the fact that stokers do occasionally neglect to unseal the Dip after charging the retort, thereby causing a waste or loss.

I feel that it is quite unnecessary for me to say more on the subject, excepting that, having had ten of Messrs. Chandler's Dip-Pipes in use more than one year, and having experienced the great benefits derived thereby, inasmuch as the yield of gas from the coal is greatly increased, and the retort perfectly free from carbon and other advantages, and seeing that the same Dip has been made perfectly self-acting by the second patent, I feel convinced that this is the right thing.—Yours obediently,

W. CRICKMAY, Resident Engineer.

For terms of use and cost, apply to Mr. G. W. STEVENSON,

4, WESTMINSTER CHAMBERS, VICTORIA STREET, S.W.

MESSRS. CHANDLER & SONS,

Gas Engineers, Patentees, and Contractors, Triennial Contractors to Her Majesty's Government,

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ERECTION OF GAS OR WATER WORKS;

CONTRACTORS FOR PIPE-LAYING AND GAS-FITTING.

SOLE MANUFACTURERS OF THE CHANDLER AND STEVENSON PATENT SELF-ACTING DIP-PIPE.

ESTIMATES FURNISHED FOR EXTENSIONS OR ALTERATION TO EXISTING WORKS.

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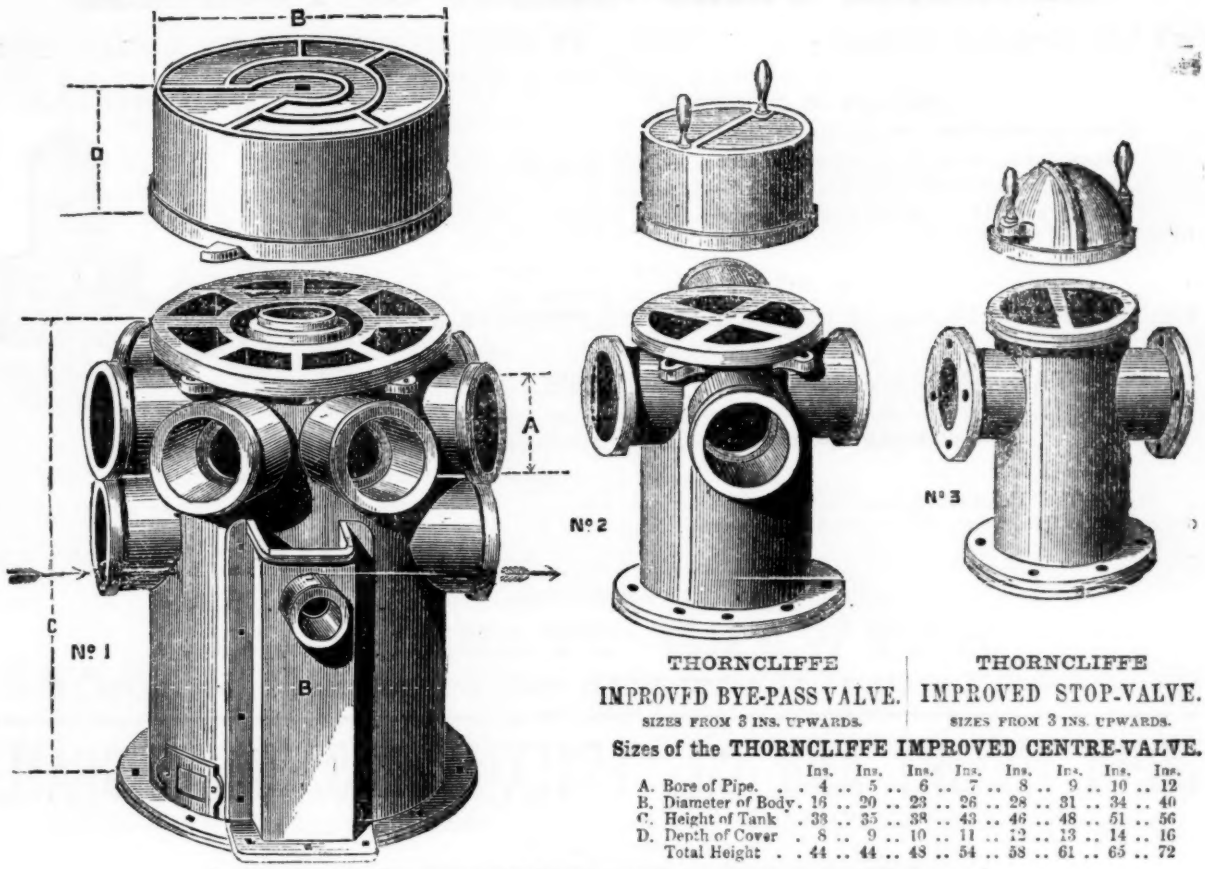
MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body.	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

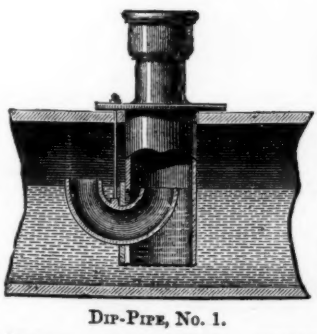
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Dip-Pipe, No. 1.

Messrs. N., C., and Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING HYDRAULIC DIP-PIPES.

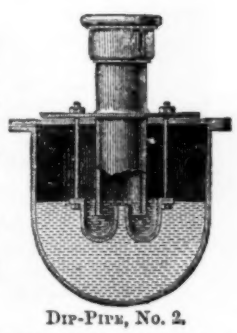
By their use the whole of the pressure caused by the Seal in the Hydraulic Main is entirely avoided, thus securing the many advantages long sought for.

Over 50 Gas Companies have already been supplied with them, many of which have been using them throughout their entire works continuously for over two years.

They can be applied to existing Hydraulic Dips, and at a very small cost.

They seal themselves in the same manner as the ordinary dip-pipes, therefore they are not likely to get out of repair.

By the aid of the adjusting screws they can be made to work on the old principle at pleasure.



Dip-Pipe, No. 2.

FOR PRICES, TESTIMONIALS, &c., APPLY TO

Messrs. NEWTON, CHAMBERS, & CO., Thorncliffe Iron-Works, near Sheffield, Sole Agents;

OR TO THE PATENTEE,

J. G. HAWKINS, NEEPSEND GAS-WORKS, SHEFFIELD.

THE

PATENT "UNIVERSAL" STEAM PUMP

WAS AWARDED, AT THE

VIENNA EXHIBITION, 1873,

THE GRAND PRIZE "MEDAL OF PROGRESS."

AT LILLE—GOLD MEDAL - - - - 1874. AT MANCHESTER—SILVER MEDAL - 1874.

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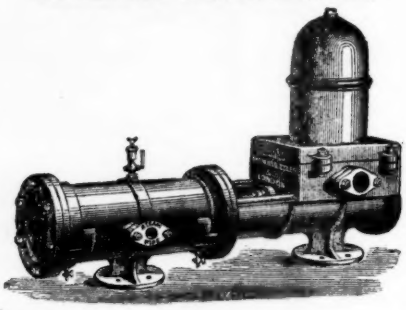
"The simplest machine of its kind."—*Engineering.*

"Remarkable for its simplicity and ease of action."—*Daily Telegraph.*

"None that we have noticed work so quietly."—*The Engineer.*

"Nothing invented in hydraulic steam power half so cheap and effectual."—*Griffith's Iron Trade Exchange.*

NO TAPPET VALVES OR GEAR.



IN USE IN SOME OF

THE PRINCIPAL GAS-WORKS IN LONDON, SHEFFIELD, PENISTONE, &c.,

FOR

TAR AND AMMONIACAL LIQUORS.

ONE SELECTED FROM AMONGST MANY TESTIMONIALS RECEIVED BY H. T. & CO.:—

"*Ardwick Bridge Chemical Works, Manchester, Oct.* 28, 1872.

"Sir,—The 'Universal' Steam Pump obtained from you, and which has been employed during the last six months pumping caustic soda at these works, still continues working satisfactorily,

"Yours truly,

(Signed) "PETER HART, *Manager.*"

SOLE MAKERS,

HAYWARD TYLER & CO.,

84 and 85, UPPER WHITECROSS STREET, LONDON, E.C.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

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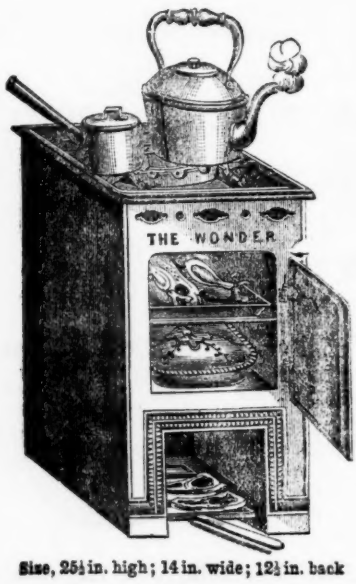
The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, yours faithfully, MAGNUS OHREN.



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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

STATION-METERS WITHOUT CASES, &c.—*A letter from Messrs. Warner and Cowen, received too late for insertion, will appear in our next.*

THE JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 16, 1875.

Circular to Gas Companies.

THE common argument employed in favour of the sliding scale of dividends is one which, we confess, we listen to with something like a feeling of shame and humiliation. The argument is that the sliding scale holds out to the companies an inducement to supply gas at a cheap rate, for the reason that they may thereby divide increased profits. Now, the Legislature have conferred a practical monopoly on the metropolitan companies; and, as a set-off, they have put a limitation on the dividends. No one can say that 10 per cent., or even 7 per cent., is not ample profit. There are very few manufactures which, at the best of times, produce anything like this gain. But, even if such profits were common, we must consider the statutory obligations of the companies, and ask whether or not they have been fulfilled.

We look over a list of the directors of the metropolitan companies. We see the names of gentlemen possessed of wealth, position, honour, of everything, in fact, which would seem to guarantee the faithful execution of their duty to the public. Turning to the chief officers of the companies, we see gentlemen of knowledge, experience, and character, second to none in the world in their position. And then we ask ourselves, can it be true that these gentlemen have hitherto conspired to defeat the intention of the Legislature, and now require a bribe (as we may call it) for the performance of their duty? We refuse to believe it. The assertion is, however, constantly made, that surplus profits, which should have been applied to the direct benefit of consumers, have been intentionally squandered in increasing the salaries of officers, and in providing unnecessary and a too costly plant. Such statements we have to read almost every week; and an idea seems to be commonly entertained that, the gas companies will do anything with surplus profits rather than apply them in reduction of price. In this opinion we, of course, do not concur; but we must admit that, if any considerable diminution in price were made under the operation of the sliding scale, it would give an appearance of truth to what we now regard as groundless assertions.

It seems to be assumed in some quarters that the Government are committed to the support of the Regulations Bill and the sliding scale in the coming session of Parliament. We do not believe that this is the fact. It is true that a letter of the Board of Trade, to Mr. Forster's committee, did point out that if a sliding scale of dividend, according to price, were adopted, it ought, in fairness to the companies, to slide upwards as well as downwards; but we do not regard this as in any way committing the Government to the Regulations Bill. Some of the permanent officials of the Board of Trade have had to give much attention to gas affairs, and their opinions will, no doubt, weigh with their present President. Sir Charles Adderley, however, is not a member of the Cabinet, and if he was, the supply of gas to the metropolis is not likely to be made a Cabinet question. We venture to assert that no Government "whip" will be issued if there ever be a division on the Regulations Bill, and that if there were, more than two-thirds of the Conservative party would be found in opposition to their leaders. The strength of the companies (not in this case merely metropolitan, or even gas companies), lies in the opinion of individual members of Parliament, who will not consider themselves bound by the report of a select committee. Still less will the House of Lords feel bound by the decision of a committee of the Commons. The sliding scale came upon both Houses last session as a surprise. Before the question again can come before Parliament there will be time for a full consideration of the consequences of its adoption, in all its relations to consumers and companies, and we shall be astonished if some alteration in opinion do not take place.

It is noteworthy that the purchase question is again pushed to the front. Perhaps some have become alive to the fact that, if the companies are to be bought, the chances are that they might be purchased more cheaply now than, say, three or four years hence. Purchase, however, we regard as at present utterly out of the question. The Corporation of London cannot buy alone, and no Government, we feel confident, will entrust the present Metropolitan Board of Works with so important a charge as the supply of gas to the metropolis. It may well be that nothing we could say would hasten the constitution of a municipality for the whole of London. We, therefore, modestly shrink from giving advice on the matter, and patiently wait, in the hope that the present Government may be induced to take up the question. Truth to say, we care little what is done. Any change must be for the better. The present Government came into office to give the country rest, and take their salaries for doing as little as possible. In the absence, however, of foreign complications and war, they must undertake something at home; and who knows that, after all, the honour of reforming the Corporation of London, and providing a real municipality for the metropolis, may not have been reserved for a Conservative Government. If that be done, the gas companies will disappear; until it is accomplished, the gas companies are safe.

Amalgamation, so far as the voluntary action of the companies can effect it, seems to have come to an end for the present. No doubt, an attempt, or attempts, will be made in the coming session to bring about general amalgamation by either persuasion or compulsion. What proposals will be made, we do not know. We will, however, on the spur of the moment, sketch a measure which might possibly receive the sanction of all concerned. We only put it forward as a crude suggestion, which occurs to us as we write. Let us take the Act of 1860 as, to some extent, a model. Add to it provisions for an official audit of accounts, such as is provided for in the Acts of 1868–69. Insert the testing clauses of the same Acts, and, in place of revision clauses, continue the provision which makes an increase of price above the fixed maximum a subject of arbitration. Lastly, let municipal representation on the direction of the amalgamated companies be provided for.

It will be imagined that we advocate the retention of the maximum price of the Act of 1860—*i.e.*, 4s. 6d. per 1000 feet. We do so, not without having regard to a possible future. Already a steady improvement in trade is reported, especially in the United States. It is certain that if this continue, the

manufacturing industry in this country will be so stimulated, that we may expect a repetition of the events of 1872-73. They may be somewhat modified in consequence of past experience, but that another great advance in the price of coal will take place, in two or three years, may be deemed certain. It is for this reason that we advocate the retention of a somewhat high maximum price, and with a view further of avoiding unnecessary litigation.

The metropolitan gas companies have now to tide over some few years, and we are anxious that they should do so under the conditions which have made their capital worth nearly twice its nominal value. Better results, we may say, ought not to be expected. Worse would now be confiscation.

The ratepayers of Ramsgate, at a town's meeting convened under the provisions of the Borough Funds Act, have sanctioned the proposal of the Local Board to promote a measure for the compulsory purchase of the undertaking of the Isle of Thanet Gas Company, supplying the district, and also the Ramsgate Water-Works. The proposal was introduced to the meeting in a very sensible and temperate speech by a clergyman, who has evidently given full attention to the subject. It is understood that the gas company, at all events, will strongly oppose the proposed measure, and it remains to be seen whether Parliament will sanction a Bill which, if it become law, will be the first really compulsory measure passed. The two cases quoted by Mr. Stevenson, do not present features strictly analogous to the Ramsgate case. The Isle of Thanet Company are not promoting a Bill, as were the Rotherham Company; and in the Isle of Thanet Company's Act there is no provision for purchase by the local authority, as there was in the Birmingham Water Act. If there had been no such provision in the latter case, we feel certain that the Lords Committee would have thrown out the Bill. It was the existence of such a provision, and that alone, which determined the decision of the Lords. If the Rev. E. G. Banks fairly represents the opinion of the Local Board, the gas company may well consider whether it is worth while to enter upon a costly struggle, the issue of which must be considered doubtful; but without knowing more of the circumstances of the undertaking, it is impossible to say whether or not the value set upon it by the reverend gentleman is a fair one. The Isle of Thanet Company were incorporated before 1847, and, we believe, have never been in Parliament since the passing of the first general Act. They are entirely unrestricted as to quality, price, and dividend. Every one who visits Ramsgate may see, however, that they supply gas of very good quality, and when some visitors learn that the price is only 4s. per 1000, they may be disposed to think it cheap. What actual cash dividends have been paid we do not know; but it is certain that large sums out of revenue must have been expended on extensions, and for these the Local Board must pay if they purchase.

It is satisfactory to us to see that the principle we advocate as the only sound one for the management of corporate gas undertakings—viz., the co-operative, or self-supporting, system—steadily grows in favour. There is no talk of building a pier at Ramsgate out of gas profits, although the place badly wants one, nor, indeed, of making other improvements which the town more urgently needs. At Halifax, too, it will have been seen by the report we published last week, that several town councillors fully endorsed our view.

Every gas engineer will sympathize with Mr. Cleminshaw on the result of an appeal by the Corporation of Dublin against a verdict which gave that gentleman, or rather would have given him, his charges for services rendered to the Corporation when they promoted a Bill for the purchase of the Alliance Gas Company. All, too, will lay the moral of the story to their hearts, and whenever they accept an engagement from a Corporation, will insist on a contract under seal. The sarcastic observations of Chief Justice Whiteside, and the pungent remarks of Mr. Justice Fitzgerald, will be read with interest outside of Dublin. They may perhaps be perused with profit in this metropolis. Like the Lord Chief Justice, we commiserate Mr. Cleminshaw. He has now to sue any members of the Corporation with whom he came in contact in the business (the leader is beyond the reach of a writ), and perhaps others who were the innocent tools of the Corporation. We are not at all surprised that the appeal was made. The Corporation of Dublin are utterly impecunious. The Public Loan Commissioners refuse them credit for a loan to pay for the drainage of the city, and the townships will not help them. It is clear that Dublin needs, more urgently even than London, a combined municipality. In the absence of this, the drainage must be ineffective, and the Liffey will be more and more polluted. But we are wandering from the topics which require discussion in this column.

The Alliance Company, it is clear, have now a long life before them, and it will be their own fault if they do not enjoy great prosperity. But we hear great complaints of the gas, which we cannot believe are justified. To answer them, we should be glad to have the reports of the gas examiner for the Corporation, and also of the independent examiner for the company, if this appointment is continued.

A case of great importance to gas companies was opened at the Wandsworth Police Court on Friday last. The London Gas Company sued a consumer for gas supplied under a contract. We need not go into details. It will suffice to say that, when the contract was put in, it was objected to, inasmuch as it was not stamped. We have looked into the question, but must not anticipate any decision of the magistrate at the adjourned hearing. It is curious that the point should have been overlooked, even by so acute a lawyer as Mr. Michael; but here is the question raised for the first time, and gas companies will await the decision with much interest.

With reference to our recent remarks on the deficient illuminating power of the Swansea gas, we have received an assurance that it only lasted during two days, while important connexions were being made with new plant. We accept the explanation, with the hope, before expressed, that the like may not happen again. We greatly dislike "*tu quoque*" repartees, but, since the Corporation of Swansea are so ready to complain of the gas, we may fairly mention that their famous water supply entirely failed last week for 24 hours.

With the understanding that the existence of a Southern District Association of Gas Managers will not, in the least, prejudice the interests of the British Association of Gas Managers, we cordially welcome into the world the association first named. The inaugural address of the first president of the newly-formed association, which we print to-day, is full of interest, and may be read with profit. The proceedings at the meetings of the new society are, we understand, to be sociable and conversational rather than formal, and are to be held quarterly. At these meetings we may hope that subjects will be prepared and elaborated, for discussion at the great Parliament of gas managers who assemble once a year.

The Fleetwood Gas Company have been heavily fined for the presence of sulphuretted hydrogen in their gas. The presence of the impurity was clearly proved by a competent witness, and we shall not allude to the nonsensical evidence of a medical man, who seems to labour under the delusion that people breathe gas, and do not burn it. We may confidently expect that the state of things described has been remedied before now. If lime is difficult to obtain, and is costly at Fleetwood, an order sent would soon bring a supply of oxide.

The Town Council of Colchester have resolved to appoint a gas examiner. This is a proper step, taken in the interest of both company and consumer. If the examiner have the confidence of the Colchester public, we may anticipate the immediate establishment of more friendly relations between the company and the Town Council.

An extension of the gas-works of the Corporation of Carlisle seems to be urgently needed. Two courses are open to the Town Council. They may add to their present works, sufficient new plant to enable them to tide over two years, with the present annually increasing rate of consumption. On the other hand, they may apply to Parliament for power to acquire a site on which new works may be erected, with room for extensions, capable of supplying the district for generations to come. Under such circumstances, a gas company, sensibly directed, would never hesitate as to which course should be followed. A majority of the Carlisle council have, however, resolved to follow the "penny "wise and pound foolish" system, and patch their present works for the supply of urgent needs. The Town Council have done well with their gas undertaking, and we feel satisfied that some enterprise would enable them to do better. A day will shortly come when they must have new works, and by that time, probably, land will have become considerably dearer.

Water and Sanitary Notes.

THE sixth and last report of the Rivers Pollution Commission has at last been issued, and it is needless to say that it is a relief to know that we shall have no more of these documents. The present volume, of no small dimensions, is occupied mainly by an account of the domestic water supply of England. Until we have had time to make ourselves further acquainted with its contents, we shall abstain from comment on any part but that relating to the water supply of the metropolis. The water at present supplied to London is, as might have been expected, condemned by these commissioners, as hopelessly and irremediably bad. They recommend that the Thames should be, as early as possible, abandoned as a source of water for domestic use, and that the sanction of Government should, in future, be withheld from all schemes, involving the expenditure of more

capital, for the supply of London from the Thames. Lea water also receives unmitigated condemnation at the hands of the commissioners. The quality, they say, is constantly deteriorating, and there is no hope of purifying it to such an extent as to render it safe for domestic use. It is suggested that the spring-heads of the two rivers should be tapped, but the commissioners apparently overlook the fact that both rivers are at present navigable and navigated. As regards the Lea, the matter may not be of so much importance, but if the water of the Thames were taken from its fount, to rinse out London, and be carried through a different channel to Barking and Crossness, very important consequences would, we expect, ensue to the upper part of the river. The Commissioners have, however, alternative recommendations.

Excellent water may be obtained from the chalk formation around London. It contains some "previous sewage contamination" of distant centuries, and it requires softening, which may presently become a costly operation. It is in its present state a good and wholesome water; but the question arises, if the water for the metropolis were pumped from wells in the chalk, how long would the supply last? Only a speculative answer can be given to this query. The amount of water at present stored up in the chalk must be enormous, but the store is added to, very slowly. We have a strong suspicion—it can, of course, be only a suspicion—that if London were supplied from chalk wells, ten years of pumping would so reduce the supply that recourse to another source would be inevitable. We fancy the commissioners see this, and, therefore, we find an allusion to the Bala Lake and Cumberland schemes. The commissioners say, with truth, that the execution of these would be costly, and they affect to think them unnecessary.

As a matter of course, it is suggested in this report that the water supply of the metropolis should be in the hands of a responsible public body, and that there should be a constant supply. The only obstacle now existing to a constant supply is the inaction of "responsible public bodies." Water companies, of their own mere motion, continue to give a constant supply to additional districts, and the responsible public bodies look on, and merely say, "We do not object." This is not what was expected when the general Act of 1871 was passed.

We need hardly say that a really responsible public body may very soon be possessed of the metropolitan water supply, with very little trouble. It will cost them, say, twenty millions. For another five millions, perhaps, they may be able to obtain a temporary supply of water from the chalk. For an expenditure of from ten to fifteen millions they may be enabled to bring a supply from North Wales or Cumberland. But does any rational man suppose that the inhabitants of London would be one whit the better in health or longevity for the change and the expense? We pass, for the moment, from further allusion to this report, which will, however, require a good deal of our consideration.

Want of space this week obliges us to defer a lengthened notice of the proceedings at the last meeting of the Metropolitan Board of Works, relative to the application of the Artizans Dwellings Act to a district in Whitechapel. It is, however, so seldom that we have to agree with Mr. Richardson, that we must take the opportunity of expressing our perfect concurrence with much that he advanced. We regard it as indefensible that an improving neighbourhood should be dedicated to be perpetually a home for pauperism. Many considerations—political, we may say, as well as social—will have to be thought over before the Artizans, &c., Act is applied to a neighbourhood. But one question must first be asked in all cases—Who will be compensated for the demolitions? We see, with much pleasure, that the Board are about to apply to Parliament for power to put Torrens's Act in operation. The scope of that Artizans Dwellings Act, and of the more recent enactment, differs very considerably. Under the latter, a huge "job" is possible; the former is emphatic in the inculcation of the principle that, the owners of property have their duties as well as their rights.

HULL GAS SUPPLY.—The average illuminating power of the gas sent into the district of Sculcoates and Myton during October by the British Gas Company was within a fraction of 16 candles. Neither sulphuretted hydrogen nor free ammonia was at any time present to the ordinary tests. The results for the month are—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·37	15·08	15·99
Grains of sulphur per 100 cubic feet . .	27·00	25·50	26·37

Mean barometer and temperature in experiment-room:—Bar., 29·96; tem., 59°. —JAS. BAYNES. *East District:* The gas supplied to the east district by the Sutton, Southcoates, and Drypool Gas Company during October was of good illuminating power. The sulphur compounds were low. The results for the month are—

	Max.	Min.	Mean.
Illuminating power standard sperm candles	16·70	16·21	16·39
Grains of sulphur per 100 cubic feet . .	—	—	5·73

Mean barometer and temperature in experiment-room:—Bar., 29·83; tem., 56°. —JAS. BAYNES, jun.

WEST'S APPARATUS FOR DRAWING AND CHARGING RETORTS, & IMPROVED METHOD OF GAS-MAKING.

IN the JOURNAL OF GAS LIGHTING for June 30, 1874, pages 911 and 912, a full description was given of the apparatus invented by Mr. West for facilitating the drawing and charging of gas-retorts. The apparatus is now in full operation at the Maidstone Gas-Works, and a visit to see it in action will amply repay any gas manager for his trouble. If perfection in machinery consists in simplicity of construction and ease in action, Mr. West may be said to have very nearly attained perfection.

We shall here give but a brief description of the apparatus and system, referring the reader to the number of our JOURNAL indicated above, for complete details and drawings. In the first place coal, broken into small pieces, is raised by means of an "elevator" to a large hopper, placed in a convenient position over a line of rails passing in front of the retorts. With this operation the use of steam power ceases; the rest is done by hand—with what facility will presently be seen.

The drawing part of the apparatus consists of a simple rake, carried upon a light frame, which travels along the rails. Means are provided for raising and lowering the rake according to the height of the retort. When placed in position, the stoker has only to push the rake forward and pull it out again, bringing with it, in most cases, the whole of the coke. The weight of the rake is borne by the frame, so the stoker has nothing to lift.

The charging apparatus consists of a trolly running on the rails before mentioned, which trolly carries a hopper, and what is called the "charger," a kind of box running on four wheels. Simple means are again provided for raising and lowering this box according to the different elevations of the retorts. Placed in position, the "charger" is filled with coal from the hopper, and is then pushed into the retort. Arrived at the end, a handle is turned, and the coal is let out on the floor of the retort, and as the "charger" is withdrawn, a simple contrivance at the bottom spreads the coal in an even layer. This general description will suffice to show the enormous saving of "energy" involved in the use of the apparatus. We have not here made use of the term "labour," for with that is always associated the notion of "cost," and to that part of the question allusion will presently be made. What we wish to point out now is, the less exhausting character of the stoker's work. He has no heavy rake to lift and carry about. He has no scoop to fill and raise with its load of coal to the mouths of the retorts. The only force it is necessary to exert is that required to push in and draw out the rake and the charger. A boy moves the trolly along the rails with the utmost ease. The stokers bear emphatic testimony to the labour-saving value of the machinery. We should mention here, that when we visited the works, the time occupied in drawing, charging, and fixing the lid, averaged 51 seconds per retort.

At the present time the whole of the retort-house at Maidstone is not adapted to the new machinery, and this makes it difficult to arrive precisely at the saving in the cost of labour, which may be effected by its employment. A little consideration, however, will show that the economy must be marked. Under the old system of working, it is, we believe, considered necessary to have one man to every ten mouthpieces. Now the labour with West's machinery is so light that it may be fairly estimated that one man to twelve retorts at least would suffice. To put it in another way, it may be said that the make of gas per man per 24 hours would be raised from, say, 50,000 to 65,000 cubic feet, which is practically an economy of 30 per cent. in labour. On this question there is still something to be learnt, by more extended workings, but the advantages of West's machinery are so obvious and real, that there can be no doubt that a large saving must be effected.

Our readers know that Mr. West's system includes the use of light and short charges. Of this part of the system we have before spoken in terms of commendation, which practical results have fully justified. As a fact, 22 tons of Newcastle coal yielded 227,000 feet of gas, equal to 10,300 feet per ton. The same coal, worked in the old way, gave only 9000 feet per ton. In this instance the gain was large, but we feel satisfied that in every case, light and short charges, with a sharpish heat, will give an increased make. The reports of Dr. Letheby and Mr. Keates our two great authorities on the matter, show that the quality of the Maidstone gas—much the greater part of which is produced on West's system—is excellent. We tested it ourselves, on the occasion of our visit, and found it to have the illuminating power of 15·78 sperm candles.

Necessarily, the mode of operating we have described alters, to some extent, the character of the coke produced. It comes from the retort, in fact, in two layers. That on the floor of the retort is compact, hard, and dense, much the same as ordinary coke; but the upper layer is light, friable, and, we might say, vesi-

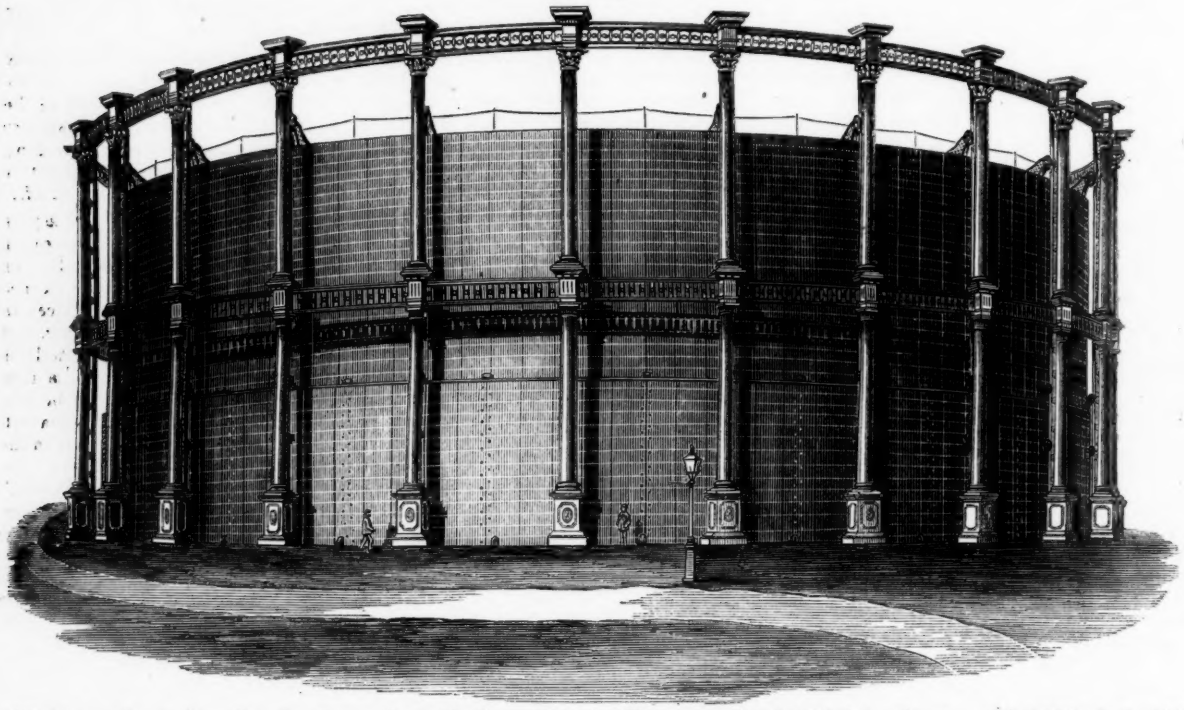
culated by the passage of the gas through it. One result of this is an average gain of about 8 per cent. in the bulk of the coke, with this advantage—that the light friable fuel is admirably adapted for consumption in ordinary grates and fire-places. In Maidstone it commands a higher price than can be obtained for the coke produced on the old plan. If it be urged that the coke is too tender to stack, our reply is that coke, in small works, ought never to be stacked; and the best way of preventing a necessity for keeping it on hand is to produce an article which commands a ready sale.

In closing this brief notice, we may sum up the advantages which the use of the machinery and the new system offer as follows:—In the first place, a gain of 5 per cent. in the make of gas; in the next place, a saving of, say, 20 per cent. at least, in the cost of the carbonizing; and, lastly, an increase of 8 per cent. in the bulk of the coke produced. These advantages put together make a total gain, which we need hardly say is well worth the serious attention of gas directors and managers. We have treated the matter very briefly, and our object will be attained if we induce managers to go, see, and calculate for themselves. We have only to add that the system has been witnessed and reported on by Messrs. Livesey, Woodall, and Spice—better practical authorities than we can profess to be—who all speak of it in terms of high commendation.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

LXXIII.

GASHOLDERS.



Already we have given the drawing and specification of the large tanks constructed at the Imperial Company's works at Bromley, and this week we present an engraving of one of the corresponding gasholders complete.

The engineer of the company, Mr. Kirkham, has favoured us with a copy of the specification, as well as the drawings of these holders; but, as want of space does not permit of the insertion of all the details, we must restrict ourselves to a brief general description.

As stated, the vessel is telescopic, the inner holder being 197 feet 6 inches in diameter, and 35 feet 4 inches deep at the sides. The outer holder is 200 feet in diameter, and 35 feet deep, and is guided in the tank by 56 wrought-iron guides, the combined working capacity of the apparatus being 2,000,000 cubic feet.

The holders are guided by 28 pairs of cast-iron columns, each of which is surmounted by an entablature, and fixed on a massive cast-iron pedestal. The columns are supported by two tiers of very ornamental girders, and the whole forms, with one exception, the largest and, perhaps, the most elegant specimen existing of this description of structure.

The roof of the inner holder is trussed by 28 main bars, 28 secondary bars, and seven rings of bracket bars or purlins. Each main bar extends from the top curb to the centre cup, and represents in section a web 12 inches wide by $\frac{1}{4}$ inch thick, and at the top and bottom of this is rivetted respectively, two bars of angle iron 4 by $2\frac{1}{2}$ by 5-16ths inch, forming a beam in section 12 inches high, and $8\frac{1}{4}$ over the flanges at the top and bottom. These are strengthened at the ends or points of attachment to the curb and centre cup. They are further supported by their corresponding suspension-rods of round iron 2 inches in diameter, each provided with seven struts, their corresponding tension-rods, and diagonal stays.

The secondary bars are formed of 5 inch by 4 inch by 7-16ths inch T-iron, each being trussed by three $1\frac{1}{2}$ inch pillars and tension-rods of $\frac{3}{4}$ inch diameter. The seven rings of bracket-bars, or purlins, complete the trussing for the roof.

The centre-pipe, or king post, together with the cup, is 31 feet long, and to the latter all the suspension-rods are attached in the usual manner.

The roof is domed in the centre to a height of 9 feet, and the means of obtaining the proper curve is described with clearness in the specification.

The crown plate is 12 feet in diameter, and 7-16ths inch thick, formed by four segments, the plates being butted together and secured by straps or lapping pieces, 5 inches wide and $\frac{1}{2}$ inch thick, and rivetted with $\frac{1}{2}$ inch rivets.

The plates forming the top of the holder are as follows:—On the outer ring, nearest the curb, are placed 28 plates, at equal distances apart, each of 4 feet wide and 7-16ths inch thick, and on these repose the jib guide carriages; the rest of the ring is composed of plates, $\frac{3}{8}$ inch thick.

The plates of the second ring from the curb, as well as that adjoining the crown plate, are $\frac{1}{4}$ inch thick. In the third ring from the curb, and the second from the crown, the plates are 3-16ths inch thick, and the next rings are of No. 8 gauge; all the rest of the plates forming the roof being of No. 9 gauge. The strength of the plates forming the side of holder will be described when referring to the outer holder, both vessels being alike in this respect.

The top curb is formed by an upper and lower curb, the former being a single ring of 5 by 5 by 9-16ths inch obtuse angle iron, in 56 equal segments or pieces.

The under curb is made of two rings of 5 by 4 by 9-16ths inch angle iron, the one being smaller in diameter than the other, the two rings being rivetted to an annular plate, 16 inches wide and $\frac{3}{8}$ inch thick, made in 112 equal lengths, and put together with lapping pieces, or fish-plates. (The lapping pieces are always thicker than the other parts of which they enter into the composition, and are never less than 2 feet long.)

The hydraulic cup, 18 inches deep, is formed by a bottom plate, 20 inches wide and $\frac{5}{8}$ inch thick, made in 112 segments; the ends of these, like all the flat plates entering into the formation of the cup, grip, or trussing, are planed at the ends to form good butt joints. There are three rings of angle iron, 5 by 5 by 7-16th inch, in 56 segments, two of these being rivetted to the bottom annular plate by a double row of rivets. The third angular iron, 3 by 3 by $\frac{1}{2}$ inch, is placed at the outer circumference of the cup, and rivetted to the other angle iron, a band of half-round iron, 3 inches wide, being rivetted to the top of the cup.

The vertical stays are box lattice girders—that is, a combination of the two principles of the box and lattice. Of these there are 56 in the interior, and 28 flat stays on the exterior.

To the top of the holder are attached 28 wrought-iron jib carriages, to which are fitted the rollers for guiding the holder.

The bottom curb of the outer holder consists of two rings of angle iron, 5 by 4 by 7-16ths inch, attached to a ring of 12 inches wide and ½ inch thick, and is provided with the necessary rollers.

The grip of the outer holder is made similar to the curb of the other, but is 15 inches deep.

There are 17 tiers of side sheets, the lowest being 3 feet deep, the thickness of the bottom and the top tiers of plates 5-16ths of an inch. The two next tiers are of No. 6 gauge, all the rest are of No. 10 gauge. This holder, like the other, has vertical stays both inside and outside, and has its corresponding rollers on the grips, as also at the bottom.

A peculiarity not frequently met with is, that all the joints and seams of the holders in every direction are double rivetted; also that the lengths of all the parts forming the cup and curbs are multiples of the number of columns which guide the holder.

Each of the 28 pairs of columns, with its pedestal, is about 75 feet high, and is 2½ inches thick at the bottom, and 1¼ inch at the top. The girders are what are termed composite—that is, formed of cast and wrought iron, and are, like the whole of the apparatus, of excellent design; but whether the system of trussing roofs in the manner described will continue to be carried out hereafter, is somewhat doubtful. Time alone will determine. A hand-rail is placed around the top of the holder to prevent accidents.

The inlet and outlet pipes are 36 inches in diameter, and made of wrought iron.

The whole of the stipulations in the specification are conducive to obtaining work of the first quality, the general details exceeding those of any similar document which has come under our notice. Among these stipulations are, that the holder shall be filled with air three times and allowed to descend, in order to give the engineer the opportunity to examine all the various parts before the vessel is filled with gas. An innovation introduced into its construction is to have an inverted cup attached to the roof of holder, over the pipes of inlet and outlet, by which means, when the holder is down, and the water in the tank at its full height, the pipes will be sealed, so that, if desirable, they can be cleaned.

There are three of these holders in operation at the Bromley works, constructed by Messrs. Westwood and Wright, to whom we are indebted for the photograph from which the engraving is made; and other three tanks erected, ready for the holders, of similar construction to that in question. We believe that, for strength, durability, and excellence of design, they are not to be surpassed by any in existence. It would, undoubtedly, have been of considerable interest to many of our readers, if a copy of the specification had been given; but as this is very lengthy, and refers repeatedly to ten sheets of drawings, it was impracticable.

To convey more forcibly the idea of the magnitude of one of these holders, it may be observed that about 220 tons, or 2200 sacks of coal are required to produce the desired quantity of gas to fill it. The weight of that quantity of gas (assuming its specific gravity about 460, air being 1000) will be no less than 33 tons, yet it will possess an ascending power or force approaching to 40 tons; in other words, 2 million cubic feet of air weigh 73 tons; therefore the term "light as air" is not so applicable as generally supposed. These estimates are only approximative, and are influenced by every change of temperature and pressure of the atmosphere, a subject which will hereafter engage our attention. The value of the same quantity of gas at 4s. per 1000 feet will be about £400, and the light yielded by it, supposing it to burn for one hour only in Argand burners, would be equal to that derived from 6 million candles.

Hence in the daily operations of filling one of these holders, the quantity of coal carbonized, and the gas produced, will be equal to the entire yearly operations of many works supplying small towns, whilst the amount stated would approximate the gross annual revenue for gas at such a work.

The average daily quantity of gas manufactured by the Chartered Company throughout the year may be estimated at upwards of 12 million feet, that of the Imperial Company bordering upon 11 million feet. As already mentioned, the largest daily production of the latter company during the past year was no less than 23 million feet, representing an approximative value of £5000. These quantities are moreover being increased daily.

Winsor proposed a capital of one million, wherewith he intended to light all the British possessions. About ten millions are now invested for lighting the metropolis alone; and very probably, in the course of 20 years, that enormous capital will be doubled. Beyond that we dare not venture to speculate.

(To be continued.)

ACCIDENT AT THE ROCHDALE GAS-WORKS.—On Friday evening last an accident occurred at the Rochdale Gas-Works, by which a young man was buried alive and two men injured. A gas-tank has been in course of construction for some time at these works, and on Friday evening, when a stone weighing about five tons was being lowered into the dry well, the chain broke and the stone fell on to the stage beneath, knocking it down, as well as the props which supported the earth on each side. George Mumford, aged about 16 years, of Peal Street, was standing at the time on the stage, and fell with it. Lancelot Palmer, of Cutgate, and George Hardy, of Manchester Road, two of the workmen, rushed down to extricate Mumford, whose foot was fast between some woodwork, and while thus engaged, 50 or 60 loads of soil fell from the side and buried Mumford 6 or 7 feet deep. Hardy and Palmer were partly buried, but were soon got out and removed to the infirmary. Hardy has received serious internal injuries, but Palmer has escaped with slight injuries. Mr. J. S. Littlewood, the mayor, was promptly at the scene of the catastrophe, and superintended the arrangements for the extrication of the body of the unfortunate youth.

Correspondence.

THE PROPOSED TRANSFER OF THE RAMSGATE GAS AND WATER WORKS.

SIR,—In your last issue I see a paragraph which states you consider the gas and water works of Ramsgate are "safe" in the hands of the companies for another year, and I fear, for some reason, you imagine the local board of this town are desirous of taking over these two works without paying the shareholders a proper sum for their property. As the official adviser of the Gas and Water Inquiry Committee appointed by the local board, I can assure you such is far from being the case; the board are desirous of paying the shareholders a fair sum for their interests, and have offered to refer the question of compensation to two eminent engineers, one to be nominated by each party, with a final umpire, and to pay the sum awarded by these gentlemen.

I hardly know any fairer means of ascertaining the value of these works, and the compensation to be paid to the officials, &c. If any can be suggested, I know the committee (delegated with full powers to effect the transfer) will be most willing to adopt it.

As a matter of public policy, I have no hesitation in saying, with John Stuart Mill, that these monopolies ought to be in the hands of the people's representatives. In this opinion you and I possibly differ, but I am quite sure your desire to fairly do a public duty will prompt you to receive with all due consideration the assurance that, so far from wishing to take any undue advantage of these two companies, the committee desire only to acquire their works and interests at their full commercial value; and, when so acquired, to work them for the public good, so that we may hope the supply of gas and water will be "safer" in their hands than in those of commercial companies.

Ramsgate, Nov. 13, 1875. E. B. ELLICE-CLARK.

THE TESTING OF GAS.

SIR,—In testing gas, I use the following table to save the trouble of having a number of small weights:—

CONSUMPTION OF TEST CANDLE.

Table showing the Consumption of Grains per Hour by ascertaining the Time occupied by the Candle in burning 20 *Grains.**

The result will be the same by using 40 *Grains and Two Candles.*

Grains.	Time. Min. and Secs.	Equal to per Hour.	Grains.	Time. Min. and Secs.	Equal to per Hour.
20	10 54	110	20	9 45	123
,,	10 48	111	,,	9 40	124
,,	10 42	112	,,	9 36	125
,,	10 37	113	,,	9 31	126
,,	10 31	114	,,	9 27	127
,,	10 26	115	,,	9 22	128
,,	10 20	116	,,	9 18	129
,,	10 15	117	,,	9 14	130
,,	10 10	118	,,	9 9	131
,,	10 5	119	,,	9 5	132
,,	10 —	120	,,	9 1	133
,,	9 55	121	,,	8 57	134
,,	9 50	122	,,	8 51	135

Having arranged two candles in the scales as they are intended to burn, I put shot into the scale-pan that the candles are in until it is at rest. I then allow the candles to burn on, and at the moment the scale-pan rises I start a stop-clock, and then put a 40-grain weight into the same scale-pan, which again weighs it down; and then the moment the pan rises again I stop the clock, which gives me the exact time the two candles have been burning 40 grains. WILLIAM FORDE.

Cork Gas Consumers Company, South Mall, Nov. 8, 1875.

* [Similar tables have already been published, but the reprinting of them may be serviceable to some of our readers.—ED. J.G.L.]

STATION-METERS WITHOUT CASES.

SIR,—"J. T." evidently thinks that the question between us is no *trifling* one, and, therefore, he resents, apparently, anything like fun. Having already passed, in the discussion on this subject, from "grave to gay," I will now endeavour to proceed "from lively to severe," and trust that, in so doing, I shall satisfy "J. T." He suggests my being "very much at sea," and that I was "insufficiently acquainted" with the character or construction of *his* meter, when I wrote from the country, and furthermore that I asserted that a drum mounted in the way he specified *would not work*. I said *no* such thing; and in making such observations as he has done, he lays himself open to the suspicion of realizing as little the force of language as he does the conditions under which gas should be measured. However, I have no wish to continue the argument in the satiric vein, and if I have said anything which is offensive to him, I frankly offer him my apology; for, although he has only *re*-invented an old scheme, I cannot but admire his ingenuity.

In my last I gave a *dogmatic* opinion; but "J. T." is altogether wrong in supposing that I did so without full consideration—after 25 years of practical experience in meter-making; and with, as I am vain enough to think, *some* reputation at stake in the gas world, "J. T." might have been satisfied that it was very unlikely for me to rush into print unless I was certain of the soundness of my position. I said, in respect to a meter-drum mounted on his plan, that "it would be altogether useless for the purpose intended," and to that assertion I adhere. It is *absolutely* true, from the point of view which I have taken throughout the discussion, which is that of the *engineers*, and not the *toy* makers. We have here no question of making a philosophical *toy*, but of making a *working machine*.

Now, what is the "purpose" which a meter must serve? *The accurate measurement of gas under the least expenditure of force or motive power*, and with the least danger of derangement of the machine.

Well, *measurement* may possibly be tolerably well effected on "J. T.'s" plan with a *small* meter, but I doubt with a very large one. What, then, as to motive power? "J. T." admits that a small wheel, size not stated, *worked*, at a speed not specified, under *one inch* pressure. Now, I think I am justified in concluding that the drum used was of such size that, as usually mounted, it would work at full speed under *one* or, at most, *two tenths* of an inch pressure. Here, then, is an increase of five or ten times the resistance! Such a consumer's meter would be "useless for the purpose intended," which is, to measure gas under the pressures which gas companies can afford to maintain in the mains.

Next, as to station-meters. Some short time since I was engaged in the construction of a large station-meter, the friction or resistance of the drum of which, when working at full speed, was under 6-10ths of an inch of water pressure; and (apart from the shaft) the drum, although made, according to my understanding and experience, *only* sufficiently strong to resist the strains to which it was to be exposed and be durable, weighed about two tons, but was certainly *not* fitted, at that weight, to serve as a tank to contain a body of water equal to the weight of more than *twenty-five tons*. Hence, on "J. T.'s" plan, the drum would need to be greatly strengthened, thereby increasing cost, weight, and resistance to motion. Now, supposing the resistance increased *only* ten times, or to *six inches*, what does that involve? Continued additional work on the part of the exhauster, with the accompanying expenditure of fuel, besides some other evils which I will not stop to specify.

Next as to derangement. The meter I have mentioned was fitted with 20-inch inlet and outlet pipes, as specified by the gas company's engineer. What chance would there be of maintaining stuffing-boxes of a suitable size sound? With ammonia and tar in the water, there is, as I know, difficulty enough with small ones; but, with such enormous boxes, I venture to think the difficulty would probably be insurmountable. And then, when all these objections are added together, what becomes of the *merit* of "J. T.'s" system? and does it not appear clear that my assertion, "utterly useless for the purpose intended," is correct.

I have purposely abstained from entering into many details and arguments, inasmuch as my time is pretty well occupied with other matters, and, in addition, believe that what I have now said will suffice. In concluding this letter, I beg to say that it is the last which I shall write—at least, for some time to come—on the subject of "Meters without Cases." F. W. Hartley.

55, Millbank Street, Westminster, S.W., Nov. 10, 1875.

UNTRUSSED GASHOLDERS.

Sir,—Glancing at the table of contents of the last impression of your Journal immediately on receiving it, I observed the words "Untrussed Gasholders," and as the subject is of considerable interest to me, I was very glad to see some correspondence relating thereto; and much more gratified was I to find such a long letter, and from such an able and popular writer as Mr. George Anderson, that I at once resolved to put the Journal on one side, until my leisure could afford me the time and pleasure to thoroughly digest the intellectual treat I had reserved.

Such an authority as Mr. George Anderson on any subject is certain to afford to some instruction, and to others more or less pleasure and amusement. I admit, before starting, I anticipated enjoying his letter in all senses; but, after a very careful perusal, I am compelled to say I was dreadfully disappointed. I expected to read something new, but, from the commencement to the end, with the exception of the comparison of a trussed crown to a spider's web, every idea Mr. Anderson holds forth is as ancient as the date of construction of the first untrussed gasholder.

My disappointment reached its climax when I arrived at the last paragraph, wherein Mr. Anderson writes as follows:—"A few years ago *I* stood alone in the advocacy of untrussed gasholders," &c. I trust you will permit me this opportunity of reminding Mr. Anderson—or, if he does not know, to inform him—that a few years ago there was an advocate living who fought the cause of untrussed gasholders to as great an extent, if not greater, than ever Mr. Anderson has done, and who had to contend with considerably more opposition than ever it was Mr. Anderson's lot to encounter. The gentleman to whom I refer is the writer's late father. John Methven.

London Gas-Works, Nine Elms, Nov. 12, 1875.

DEPOSIT OF CARBON IN RETORTS.

Sir,—When replying to Mr. Patterson's observations concerning the deposit of carbon in the retorts, I stated, in substance, that as the gas is derived from the "tarry vapours," any deposit of these within the retorts must be detrimental to the gas in quantity and quality, and had Mr. Patterson proved the inaccuracy of my statements instead of condemning my "reasoning," he would have had cause to congratulate himself on enlightening the profession at large, which he seems anxious to do.

That gentleman, however, takes an opposite position, and mentions what I "might as well say," and enters into another argument, and singular enough, when endeavouring to prove his case, falls into another error even more "absurd" (his own term) than the former. He says "the coke cannot possibly be converted into permanent gas, or gas of any kind!" and I must confess that I was astonished at such an assertion, as it requires only a knowledge of the rudiments of chemistry to understand that when air is in contact with incandescent coke, a permanent gas (carbonic acid) is produced, and that the whole of the coke can be resolved into that gas; and this is only one among other gases to be obtained from the same source.

Surely Mr. Patterson will adduce no power of "logic" to controvert these facts. Nemo.

GAS-EXHAUSTERS.

Sir,—In my communication of last week I see one word wrongly rendered; "primary" should have been "priming." I meant to call attention to this evil, so well known to users of steam-boilers as a loss of power and waste of fuel, because it is as much engendered by the use of dirty water as want of steam room. In connexion with this system of exhaustion, the driest steam that can be produced will leave quite as much water to deal with after condensation as will be found convenient; therefore, leaving the fuel out of the question, as little water as possible should quit the boiler with the steam. W. Mann.

Nov. 12, 1875.

Sir,—The letter of Mr. W. Mann, in your last number, shows that the effects and advantages of the steam-jet exhauster begin to be understood and justly estimated.

In response to Mr. Mann's implied desire for more information from the Continent, where so many of these exhausters are at work, I shall give you a few quotations from the proceedings of the annual meeting of the Association of Gas and Water Engineers of Germany, held at Mayence in June last. In an extract which I have recently received from those proceedings, relating to the steam-jet, I find the following passages:—

The chairman, Mr. W. Oschelhausen, said: "It is decided that the illuminating power of the gas, through using the steam-jet, is in no way deteriorated." Herr Grohmann, of Dusseldorf, said: "There had been much fear that the illuminating power of the gas would be deteriorated, by the influence of the exhauster; but different parties had most decidedly declared that these fears were without the slightest foundation. Herr Grahn, of Essen, had tested the gas, immediately before and after the steam-jet exhauster, eudiometrically; and thereby conclusively proved that a decomposition of the gas did not occur."

To estimate the weight of the above testimony touching possible deterioration of the gas, it ought to be borne in mind that the continental practice is to exhaust *scrubbed* gas with the jet—that is to say, to give the gas a double and excessive washing, first with water, and then with steam.

The question of a loss of illuminating power may be considered settled. The next question deserving the attention of those who may use the jet is this—does it effect any appreciable improvement in illuminating power, particularly if used in conjuction with the steam scrubber, and more particularly if preceded by the "slow speed" or scrubbing condenser, already described in your columns, whereby the self-purifying power of gas is so greatly utilized?

For myself, if asked this question, I should give a most decided answer in the affirmative, founded not on laboratory researches, nor trials on an experimental scale, but on the continuous manufacturing operations and photometry of a large work, during which what I may call "steamed" gas and "common gas" have been produced, purified, registered, and burned simultaneously, yet separately. To this question, still an unsettled one for the public, I respectfully invite the attention of intelligent and disinterested engineers, believing it to be one which gas manufacturers can scarcely afford to neglect, since it translates itself into this business proposition—how to take more per ton from our coal and cannel, or how to use a larger proportion of the poorer and cheaper material, without giving less light per cubic foot. Wm. Cleland.

Linacre, Nov. 13, 1875.

CHOKED ASCENSION-PIPES.

Sir,—I have not time at my disposal to enter into all the details of the actual cause, and how to prevent this seeming perplexity with many of my professional brethren, yet I persuade myself a few words on the subject might not be out of place, at a time when it is frequently being referred to in your valuable pages, and also continues to be a question for solution among the subjects of interest in all the associstions of gas managers. Several patents have been obtained recently for the removal of the seal of the dip-pipes in the hydraulic, which, together with free exhaustion, have been set forth as a remedy for the evil. Allow me to state, emphatically, that all these appliances, however commendable in other respects, only tend to increase the calamity. It is now upwards of twenty years since I discovered practically that this harassing obstruction to the flow of gas in the ascension-pipes was due entirely to certain (friable) kinds of coals, which, while undergoing distillation at a high temperature, parts with the gas rapidly, and along with it numerous molecules of the coal itself, and deposited in the ascension-pipes and hydraulic.

These friable coals are commonly known as glance, cannel, parrot, and splint, or, in other words, any coal that may be affected by being exposed to the heat of the sun; or when thrown on to a bright fire, splits and flies into small particles, similar to the scales of fish. Such coal ought never to be distilled alone, but mixed with a coal of an opposite character, and that not in any greater quantity than one-third by weight.

My retorts are 22 inches by 13½ inches by 9 feet long; the ascension-pipes are only 5 inches diameter. The yield of gas per mouthpiece in 24 hours is from 8500 to 9000 cubic feet, and choked pipes are unknown. I have no hesitation in saying that, if gas managers would only give strict attention to the proper selection and mixing of the coal, this subject would certainly and quickly be ranked with the troubles that were.

All managers who have test-retorts at their disposal can satisfy themselves upon this point any day. I may add to those of Mr. Dunlop's theory that the results in this case should be much the same on a low level as on a high one. James Hislop.

Maryhill, Nov. 12, 1875.

Legal Intelligence.

SUPREME COURT OF JUDICATURE.—COURT OF APPEAL.

Wednesday, Nov. 10.

(*Before Lord Justice* James, *Lord Justice* Mellish, *Baron* Bramwell, *and Justice* Brett.)

In re the coal economizing gas company—gover's case.

This was an appeal from an order of Vice-Chancellor Bacon, refusing an application on behalf of Miss Gover, the holder of 10 shares in the Coal Economizing Gas Company, that the register of members might be rectified by striking out her name therefrom, on the ground that the prospectus, on the faith of which she applied for and received an allotment of shares in the company, did not disclose a material contract entered into by an alleged promoter of the company before the issue of the prospectus.

Mr. Jackson, Q.C., and Mr. Ince, Q.C., appeared for the appellant; Mr. Kay, Q.C., and Mr. Whithorne for the respondents, the company.

The arguments in this case raised for the first time the construction of section 38 of the Companies Act, 1867, which provides that any prospectus or notice inviting people to take shares in a company, which does not specify the dates and names of the parties to any contract entered into by the company or the promoters, directors, or trustees thereof before the issue of such prospectus, "shall be deemed fraudulent on the part of the promoters, directors, and officers of the company knowingly issuing the same as regards any person taking shares in the company on the faith of such prospectus, unless he shall have had notice of such contract." It appeared that in July, 1873, Mr. W. S. Mappin agreed to purchase a patent for improvements in the manufacture of gas, from one Skoines, for £65,000, payable partly in cash, and partly by an allotment of shares in a company to be formed and registered by Mappin for the purpose of working the patent. It was stipulated in this agreement that Mappin should, with as little delay as possible, use his best endeavours for the formation of such company, and in case he failed to form a company, the agreement was to become void, and the payment of £1000 made upon signing the agreement was to be forfeited to Skoines. In October, 1873, Mappin entered into an agreement with a Mr. Wright to sell to him, as a trustee for the company intended to be forthwith formed

under the name of the Coal Economizing Gas Company, the patent of the 8th of March, 1873, for £125,000, payable in cash and shares, with a provision that the intended company should appoint, or cause to be appointed, Mappin as the first managing director. The company was registered in November, 1873, and a prospectus was issued, containing no mention of Mappin's contract with Skoines, but setting out that between Wright and Mappin. In January, 1874, Miss Gover saw the prospectus, and was induced thereby to apply for 10 shares, which were allotted to her. She afterwards moved to have her name removed from the register, on the ground that the prospectus, on the faith of which she took her shares, from not disclosing the antecedent contract of July, 1873, entered into by Mappin, who was, according to her case, at the time a promoter of the company, must be deemed fraudulent within the meaning of the Companies Act, 1867, sec. 38, on the part of the promoters, directors, and officers of the company, and accordingly that this statutory fraud gave her a right under the Companies Act, 1862, sec. 35, to be released from her agreement to take shares.

On behalf of the company (now in course of liquidation) it was contended that Mappin was not a promoter of the company when he entered into the agreement with Skoines, and, consequently, that the omission of any notice of that agreement would not render the prospectus fraudulent under the Companies Act, 1867, sec. 38; that sec. 38 pointed to contracts which ought before that Act to have been disclosed to intending shareholders, and by requiring their notice in the prospectus was intended to put shareholders in a better position and relieve them from the difficulties they were formerly under from not having all material facts connected with the company sufficiently brought under their notice; that in any view of the case, whether from the nature of the agreement or the fact that Mappin was not at the time a promoter of the company, the agreement with Skoines did not come within the meaning of sec. 38, and lastly that the section did not entitle the shareholder to an actual rescission of his contract to take shares, but merely gave him the right to bring an action of deceit against the promoter or director who had been guilty of the omission, the words "knowingly issuing" pointing clearly to a remedy by action, and not to a release from the contract. When the case came before Vice-Chancellor Bacon, in March last, his lordship refused the application, on the ground principally that Mappin had not been shown at the date of his contract with Skoines to have been a promoter of, or in a fiduciary position towards, the company which was afterwards formed, and consequently that the omission from the prospectus of all notice of that contract was not fraudulent within the meaning of the Companies Act, 1867, sec. 38.

The arguments on the appeal occupied the court this day and the next, and at their conclusion their lordships reserved judgment.

HIGH COURT OF JUSTICE.—CHANCERY DIVISION.

SATURDAY, Nov. 6.

(*Before Vice-Chancellor Sir* C. HALL.)

HARDINGE *v.* THE LOCAL BOARD OF SOUTHBOROUGH.

Mr. WILLIAM PEARSON, Q.C., and Mr. W. BARBER appeared on behalf of the plaintiff; Mr. DICKINSON, Q.C., and Mr. RIGBY were counsel for the defendants.

The plaintiff in this case, Sir E. S. Hardinge, is the tenant for life in possession of Bentham Farm, near Tonbridge, in Kent. This farm is intersected by a stream flowing close by the farmhouse, on which two water corn-mills, with ponds attached, are situated; and the plaintiff complained by his bill that certain sewage works, which the defendants had recently constructed near Bentham Farm, and which comprised tanks for the storeage and filtration of the sewage of their district, communicated with the stream and polluted it with foul-smelling water and sewage matter, by overflow filtration and soakage, to such an extent as to render the water unfit for use, even by cattle, and to cause the choking up of the channel of the stream by foul mud, and the plaintiff sought an injunction to restrain the defendants from suffering this foul water to flow into the stream, and an order to compel them to cleanse the stream and restore its bed to its natural condition.

The case of the defendants was that they had been discharging a public duty in providing for the drainage of the district in the best manner they could, that in their tanks they purified and deodorized, as far as possible, the sewage matter, and that only effluent water, rendered inoffensive by these processes, entered the plaintiff's stream, and that any pollution of it was owing to drainage from farms, tannery works, and houses on or near the stream, with which they had nothing to do; and they denied that even in its present state there was anything offensive or prejudicial to health in the water of the stream.

There was a good deal of evidence on both sides, that on behalf of the plaintiff comprising affidavits by Sir *Joseph Bazalgette* and Professor *Voelcker*.

The VICE-CHANCELLOR said that the case made by the plaintiff's bill was clearly established by the evidence, and upon the facts so established the law also was clearly in the plaintiff's favour. The evidence showed that the water of the stream had been used for domestic purposes by the inmates of the farm, and had also been used by the cattle upon the farm, and that now the cattle would not use it. A continuing injury was being done to the plaintiff, from which he was entitled to be protected. It was said that this injury was not attributable to the acts of the defendants, and that pollution to a certain amount had existed before the erection of the tanks. But, even assuming some degree of previous pollution, the defendants, as a public body, had no right to collect in tanks a quantity of sewage matter and allow it to escape and flow along the stream. That was a new injury to any person whose property was intersected or bounded by the stream. His lordship, then, after noticing in detail other evidence on either side, referred to passages in the affidavit of Sir Joseph Bazalgette, in which the witness said: "It is, in my opinion, beyond all doubt, that the effluent waters which pass from the tanks seriously pollute the streams and reservoirs," and "I could distinctly both see and smell the sewage matter in the effluent water passing from the tanks into the stream." On the whole of this evidence, the Vice-Chancellor accordingly held that the plaintiff was clearly entitled to the decree he asked, with costs against the defendants.

COURT OF QUEEN'S BENCH, DUBLIN.—TUESDAY, Nov. 9.

(*Before the Full Court.*)

CLEMINSHAW *v.* THE CORPORATION OF DUBLIN.

In this case the plaintiff, a gas engineer, obtained a verdict in February last (see JOURNAL, vol. xxv., p. 251) against the corporation for £513 8s. on account of services rendered by him in connexion with the promotion by them of a bill in Parliament for the purchase of the undertaking of the Alliance and Dublin Consumers Gas Company. The question was now before the court on a motion to enter the verdict for the defendants, on the ground that the services for which the plaintiff sued the corporation were rendered in connexion with a matter beyond their authority—that the contract made by them with the plaintiff was not under their seal.

Mr. CARTON appeared in support of this application, and Mr. PORTER, Q.C., in support of the verdict.

At the close of the arguments,

The LORD CHIEF JUSTICE delivered judgment, and said it was a well-established principle of law that, in general, contracts with corporations should be under their seals. It appeared that Mr. Cleminshaw asked whether it was not necessary that his contract should be under seal; but Mr. Cotton the gas inspector, said it was not, and the cool-headed Englishman of science swallowed the misconception, and went on with his work. It was the duty of the corporation, under their Act of Parliament, to light the city within the municipal boundary; but instead of confining themselves to that, they took it into their heads to promote a bill to enable them to buy up the Alliance Gas-Works, to become manufacturers of gas, and to supply it not only to the city, but to the outskirts, extending as far as Dalkey, and even Bray. They got hold of the plaintiff to assist them to do this. They wanted no additional powers to enable them to light the city, and a more honourable trust could not be reposed in men than that of cleansing, lighting, and paving the city; and he said that with the knowledge of where he was sitting, and with the Liffey before him. So far from sneering at the corporation, he affirmed that those were their honourable duties; and, if they happened to be performed, the ratepayers should pay the rates cordially, and be grateful to the gentlemen who undertook that trust without any remuneration. But the corporation sought a bill to enable them to send gas as far as Wicklow, to do an immense number of things connected with the project, to levy a rate not exceeding 6d. in the pound, and to borrow a sum not exceeding £300,000. A very pretty little sum to borrow! And what was to be done with it? Of course, a whole crew of engineers, lawyers, attorneys, and persons of all sorts, would have been attentive, while the money was forthcoming, to see that it was laid out in a proper manner. An interesting debate once took place in the Irish Parliament concerning the origin of the word "job," and one orator maintained that it was not a word of Irish extraction at all, but had been imported from the other side. Of course he did not mean to say that anything in the nature of a job was intended by the promoters of this scheme. Then the bill provided every convenience for exercising borrowing powers, for it was not everybody that would have been prepared to lend £800,000; and accordingly it was proposed to be made lawful to take from banks, in cash or on credit, small sums of £10,000 at a time, in a running account. Powers were further taken to appoint officers and pay off old officials. He believed the etiquette on such occasions was to say to the latter:—"You are all well and healthy, strong, and experienced, therefore you must have pensions." The costs and expenses connected with the obtaining of this Act were to have been charged upon the ratepayers. It was possible that the £500 sought to be recovered in the present action by a gentleman whom he commiserated, might be only a fragment of the sum which would have had to be paid out of the corporate funds under this bill, had it become law. Frequently in England ratepayers applied to the Court of Chancery for injunctions to prevent their money being expended in pursuits of this sort; and it seemed extraordinary that the good people of this city did not appear to be acquainted with their rights. The code of instructions given to Mr. Cleminshaw was enough to have puzzled Solomon. He was requested to read several Acts of Parliament, and to advise the committee as to the expediency of the measure in all its details. There was hardly a clause in this bill which did not demonstrate that the project was one utterly beyond the scope and purpose of the original duties imposed on the corporation by their Acts. What had the Corporation got for the services rendered by the plaintiff? Nothing. It was therefore quite out of the question that he could recover his money out of the rates which, if they were applied to such a purpose, would be as grossly misappropriated as the rates of any public body ever were. The verdict should accordingly be entered for the defendants.

Justice O'BRIEN, in concurring, rested his judgment on the ground that the contract made by the defendants was *ultra vires*.

Justice FITZGERALD expressed his concurrence with the other judges, and said the court could not shut out from consideration the fact that this case involved the whole expenses of the bill in question. The parliamentary proceedings were very expensive; and sometimes local envy was excited by the liberality with which fees were paid to counsel pleading before parliamentary tribunals. He did not at all suggest that the proceedings of the corporation with regard to this bill were not perfectly *bonâ fide*. He had no doubt that the majority of the members had satisfied themselves that it would be a remunerative speculation, and that it would benefit the citizens. Possibly some might have thought that the profits of the gas manufacture would have led to its being no longer necessary to tax the inhabitants of Dublin. He expressed no opinion as to whether, assuming that the corporation had had authority to enter into this contract, a seal would have been necessary or not. If they had had such authority it would have been scarcely worthy of a great body to defend themselves on the ground that they had not taken the formal step of affixing their seal to the contract. But it was clear that the object of the bill was utterly foreign to the duties contemplated by their statutes; and therefore whatever remedy Mr. Cleminshaw might have against individuals, he had none against the rates.

Justice BARRY, in concurring with the other learned judges, said that at the trial which took place before him it was suggested that possibly the plaintiff might be able to point out some portions of his work which were not open to the objection in respect of the contract being *ultra vires*, but he had utterly failed to do so.

The conditional order to change the verdict into one for the defendants was, therefore, made absolute with costs.

COURT OF EXCHEQUER, DUBLIN.—TUESDAY, Nov. 9.

(*Before Baron* DOWSE.)

BURRY *v.* HALL.

This was an action brought by a member of the Corporation of Limerick against the mayor of that city, for alleged scandal and libel, contained in observations made by him at a meeting of the council, and afterwards published in the *Cork Herald*. The remarks had reference to the management of the gas-works belonging to the corporation, and to certain abuses connected therewith—namely, that certain members of the corporation were supplied with lime from the works at considerably under its value, and that one member of the corporation used a meter registering only one shilling's worth of gas in the whole year.

Mr. NAISH, for the defendant, moved for leave to plead several defences, some of which were substantially traversers of the speaking and publication of the defamatory sense imputed, and a plea of privilege to the effect that the defendant, from his position as mayor, was bound to protect the property of the corporation, and that in the discharge of his duty as such he referred to the subject *bonâ fide*, believing the same to be true. The learned counsel founded his application on the affidavit of the defendant, setting forth that he had been informed by William Spillane, chairman of the Gas Committee, of the matters to which he referred at the meeting of the corporation, and believing them to be true, he felt bound by duty to call attention to them. Having subsequently ascertained that the information was incorrect as regarded the plaintiff, who was one of the parties named, he publicly withdrew the charge against him at the succeeding meeting of the corporation.

Baron DOWSE: Is there an allegation that the slander was uttered by the plaintiff in his capacity as a corporator?

Mr. NAISH: Yes, and we traverse that; the special plea only goes to the slander. We will rely on the traverse of the publication to meet the allegation of libel. The plaintiff founds that portion of his cause of action on a newspaper report.

Baron DOWSE granted the order.

BLACKPOOL PETTY SESSIONS.—MONDAY, Nov. 8.

(*Before Mr.* J. HARDMAN *and Mr.* J. WIGNALL.)

CONVICTION OF A GAS COMPANY FOR SUPPLYING IMPURE GAS.

FLEETWOOD LOCAL BOARD *v.* FLEETWOOD GAS COMPANY.

Mr. W. ASCROFT (clerk to the local board) appeared to prosecute; and Mr. BEASLEY appeared for the defence.

In this case five summonses had been issued against the company, three for supplying impure gas on Oct. 25, and two for insufficient pressure. On the case being called,

Mr. BEASLEY applied for a postponement, on the ground that the summonses had been served too recently to allow of the company instructing counsel.

Mr. ASCROFT, in opposing the application, said the examiner appointed by

the local board tested the gas on Oct. 25, and his report was sent to the undertakers on the following day; therefore they had ample notice that the local board intended taking proceedings against them. A similar report was made on a subsequent occasion, and the secretary of the company wrote to Mr. Chew, the examiner, and virtually admitted the offence. It was also to be expected that they would watch the proceedings of the board meeting held on Monday, at which it was finally resolved to take proceedings. The summonses, too, were issued on Thursday, and he was informed by the policeman who served them that they were delivered on Thursday night, and that the managing director had them on Friday. If the company had taken any steps to improve the quality of the gas in the meantime, the case would be different, but he was informed that it was just as bad the previous night as it was on the 25th of October.

Mr. BEASLEY said he should dispute that statement.

Mr. ASCROFT said, if the summonses were adjourned, the inhabitants would continue to consume the company's gas, which he would prove was of a very impure and poisonous character. Knowing what the inhabitants had suffered during the past six months, and, in fact, ever since the works had been in the hands of the company, he could not consent to a postponement in the absence of stronger grounds than those that were put forward.

The MAGISTRATES, after consultation, determined to go on with the hearing.

Mr. ASCROFT then opened the case. He said there had been five summonses issued, three for supplying impure gas, and two for supplying it under the pressure required by Act of Parliament. It appeared that the gas company obtained a Provisional Order, 1873, and since that time loud complaints had been made about the quality of the gas. Not only on one occasion was it impure, but ever since it had been in their hands complaints had been made, and to give the bench some idea of how injurious it was, he might say it was described as resembling sewer gas, the smell being similar to that of rotten eggs; and seeing that this had been going on for some months, the magistrates would not be surprised to hear that some of the inhabitants had withdrawn their patronage from the gas company, and had taken to lamps and candles. When the evidence which would be given was before the bench, he thought it would be felt that this was a case in which full penalties should be enforced.

Mr. E. COOPER, assistant to Mr. Ascroft, produced the minutes of the local board appointing Mr. Chew, of Blackpool, as gas examiner, under the provisions of the Gas-Works Clauses Act Amendment Act, 1871.

Mr. BEASLEY submitted that there had been no formal appointment of Mr. Chew as gas examiner. He said that under the Public Health Act of 1875, urban authorities were constituted corporate bodies, and they could only make legal orders under the common seal of the board. In the present case a sealed document making the appointment official was necessary, in order that when the examiner went to make his inspection, the document, setting forth the purpose of the examiner's visit, might be produced to the undertakers. Without the seal he contended there was no legal appointment.

Mr. ASCROFT said section 29 of the Gas-Works Clauses Act, 1871, provided that "the local authority may from time to time appoint, or may appoint and keep appointed a competent and impartial person to be a gas examiner," &c. He therefore contended that it was quite sufficient, when a meeting of the local board was convened for the purpose of appointing a gas examiner, to pass a resolution to that effect, and that by producing the minutes he proved the appointment was made.

Mr. BEASLEY said that all contracts of the value of £100 and upwards, to which a corporation was a party, required to be under the common seal of the authority; but according to the argument of Mr. Ascroft, if the board purchased land (as they had the power to do) the simple record of the fact would operate as a conveyance of the land. It would not, however, be sufficient, and in like manner he contended that the appointment by the board of a gas examiner must be under their seal. Another objection he had to these proceedings was that no proof had been given of the constitution of the board, which was the first step necessary to give the board a *locus standi* in the court.

After some coversation, the Bench decided to hear the evidence in support of the summonses, and to reserve, if necessary, the point raised by Mr. Beasley.

Mr. *John Chew*, manager of the Blackpool Gas-Works, was then called. He said that on the 25th of October he received notice that he had been appointed gas examiner by the Fleetwood Local Board, and, in accordance with instructions, he on that day went to Fleetwood and visited the gas-works. He then tested the gas for purity, in the manner prescribed by the Gas Act. The gas ought to have stood the test for three minutes without discolouring the paper used, but the paper was instantly blackened, showing that the gas was strongly impregnated with sulphuretted hydrogen. He made a report the day after the examination, and forwarded a copy to the Fleetwood Local Board and another to the secretary of the gas company. In his opinion the cause of the impurity was the material used for the purification of the gas, which would not absorb sulphuretted hydrogen until it became saturated with ammonia, and during the time the material was taking up the ammonia the gas would be passing into the town in an unpurified state so far as sulphuretted hydrogen was concerned. Such gas would be injurious to health, and it would be very uncomfortable to breathe in a room where it was used. It would have a smell similar to rotten eggs when in the most advanced state of decay. He thought the evil might be cured in three or four days if the proper material was obtained, but there might be a slight trace of impurity a week after the change was made.

The following are the reports referred to:—

Blackpool, Oct. 26, 1875.

In accordance with the order received from Mr. Ascroft yesterday, I proceeded to your gas-works and made an examination of the gas, with the following result:—When tried for illuminating power in accordance with the regulations laid down in the Fleetwood Gas Order, it was found to be 17·5 candles power, the order only requiring 16 candles power, showing it to be above the standard required. When submitted to a test for purity in accordance with the Gas Act, 1871, for sulphuretted hydrogen, it was found instantly to blacken the test-paper, showing that the gas was passing to the town altogether unpurified, and in a most objectionable state. The time and means at my disposal did not allow of my testing for pressure in accordance with the Fleetwood Gas Order, which requires the test for pressure to be made at the pipe leading from the street main to the house; but on trying the pressure in the room where the jet photometer was fixed, and with only two lights burning, it was found to be but five-tenths of an inch, whereas the Fleetwood Gas Order says that the pressure at the inlet-pipe shall not be less than 12½-10ths from sunset to eleven o'clock at night. In conclusion, I think the ground of complaint is impure gas and want of pressure in the street mains. The impure gas can be set right at once at the works if the proper means are adopted for purification. The pressure can only be improved by enlargement of pipes or the clearing out of present ones from any stoppages, whichever may be the cause.

Blackpool, Oct. 28, 1875.

I last night, between the hours of five and seven o'clock, made a second examination of the gas at the company's works, Fleetwood, in the presence of the manager, and in accordance with the regulations laid down in the Gas Act, 1871. The illuminating power I found to be equal to 17 candles, being one candle above the standard required by the Fleetwood Gas Order. On testing for purity the gas was found instantly to blacken the test-paper, showing that the gas continues to be sent into the town in an unpurified state, and strongly charged with sulphuretted hydrogen. The pressure of the gas was tried at the following places—viz.: 3, Queen's Terrace, at 5.30, inlet-pipe to meter 9-10ths of an inch; 41, Queen's Terrace, at 5.45, 11-10ths; board-room, at 6.30, meter inlet, 10-10ths. This pressure, although less than required by the Act, is still a very fair pressure. A copy of my last examination was sent to the secretary of the company, and I noticed yesterday that some steps were being taken to provide better material for the purification of the gas.

In cross-examination witness said he tested the gas for illuminating power, and found that it was equal to 17½ candles, the standard in the company's Act being 16 candles.

Dr. *Aspinall* said he was a medical practitioner, and had been resident in Fleetwood for two years. During that time he had noticed the state of the gas, and had heard several complaints about it.

Mr. BEASLEY objected to evidence being given respecting any other day than the 25th ult., when the official testing was made.

Mr. ASCROFT submitted that as the bench had power to mitigate the penalty of £20, he would have a right to call evidence to show that the gas had been bad for many months, in order that they might decide as to the amount of the penalty. If the evidence was not given, then he must ask them to allow him to call additional evidence before they decided on the penalty.

The BENCH decided to confine the evidence to the date in question.

Witness proceeded to state that he was present at the gas-works on the 25th ult., when Mr. Chew tested the gas, and he could corroborate what Mr. Chew had said. The paper was discoloured instantaneously. On that night he was so inconvenienced by the gas that he put it out and purchased lamps, which he continued to use. The gas would have the effect of producing headache, tightness about the temples, extreme nausea and depression about the pit of the stomach, vomiting, and headache of all stages up to utter insensibility. There was a great quantity of sulphuretted hydrogen in the gas, and that would have the effect he had named. It was nothing better than sewer gas pumped into the mains at the pressure the gas company liked to employ. The gas had almost entirely removed the bronze from the chandelier at his house, and the bronze had been removed entirely from the hall lamp-rods, which were coated with a deposit of sulphuretted hydrogen. He had known birds killed by the gas.

Mr. *Chew* recalled, said the purifying material he saw at the works was largely used for taking the ammonia out of the gas, but not for any other purpose.

Mr. *C. Gaulter*, hotel-keeper, Fleetwood, said that he took a bladder of gas from one of the mains on the 25th of October, and locked it up in a desk in the office of the local board. He kept the key in his possession till the 29th of October, when he gave the key to George Carter. He remembered the state of the gas on the 25th of October. It was very unpleasant, and he had to turn out the lights. It was very objectionable in the house, and he could not stay in the room. The gas made him cough.

George Charles Carter received the key from the last witness, and took from the cupboard a bladder of gas. He gave it to Dr. Bird just before he went away by the train.

Dr. *Bird*, medical officer of health, stated that he received from the previous witness, on the 29th ult., a bladder of gas. On testing the gas he found that it contained sulphuretted hydrogen and carbonic acid. He thought the supply of such gas would be injurious to the town.

This was the close of the case for the prosecution.

Mr. BEASLEY, in addressing the bench, said he had hoped that some one better able than himself would have had an opportunity of defending the gas company against these charges, and he must certainly express his surprise that the request he made at the opening of the case was not complied with, seeing the reasons that he urged, and he ventured to say that the poorest man would not have been prevented from producing his witnesses, consulting his attorney, and completing his defence—privileges which the gas company had been denied and the denial of which threw the whole of the responsibility upon him, and he assured them he felt it be to an onerous one. He should have been very glad to have met the cases on their merits; but, owing to the absence of witnesses, and a want of opportunity of making fuller inquiries than he had been able to make into the facts of the case, he had been compelled to take objections that otherwise he would not have felt it his duty to take. That being the case, he had a number of objections to urge as reasons why the summons should be dismissed; but before doing so he would reply to the opening of Mr. Ascroft, which was, to some extent, irrelevant. He had no wish to prevent anything respecting the affairs of the company from being known; on the contrary, he was desirous that everything should transpire. From the very first the Fleetwood Gas Company had been anxious to supply, no matter at what cost, a proper article to their customers. It seemed to him that the prevalent idea was that the company benefited from the sale of an inferior article, than which nothing could be more fallacious; no one, in fact, knew better than the company how injurious it was to sell an inferior article. Such a proceeding did not effect any saving of expenditure, and there would naturally be less consumption of gas if it was of bad quality. And yet the bench were asked to believ that the company caused all this by some paltry cheeseparing economy. H might have to renew his application for a postponement before he concluded; but, regardless of that, he would like to state that, with respect to the offence alleged on the 25th of October, the condition of the gas arose entirely from an accident. Mr. Chew, the examiner, had told them that there was no lack of purifying material in the yard, assuming it was of the proper description; and he should be able to prove by witnesses, if he was allowed an adjournment, that it was of the kind that was exclusively used by some of the largest gas companies in the kingdom. A quantity of this material had recently been obtained, and the purifiers charged with it; but from some unexplained cause they did not act. The discovery was not made until a considerable quantity of impure gas had passed on into the holders, and thence into the town. The consumption in Fleetwood not being large, the whole of that impure gas had not been disposed of, and this fact accounted for the time during which the nuisance was alleged to have existed. As soon as the discovery was made, steps were immediately taken to obtain lime, the material previously used, but none could be procured in the town, and it was two or three days before the manager could get any. The bench had heard that five summonses had been issued against the company for selling impure gas and gas with deficient pressure. What all those summonses had been issued for he could not tell; because, if it was only to get the gas improved, they might have ascertained from the company the fact that steps were being taken for that purpose. It seemed to him that the people of Fleetwood were rather thin-skinned about these matters. Ever since the company had been established, from some cause or other, they had not got on well with the people of Fleetwood; but the bench had not been told that, before the present company took possession, the gas-works were indifferently managed, and there were then very good grounds of complaint. The present proprietors were being punished for the misdeeds of their predecessors, on the principle, he supposed, of the children being visited for the sins of their fathers. This was the only explanation he could give of the motive of the board in taking out five summonses against the company, but whether there was any other he could not tell; but not satisfied with issuing five summonses, involving penalties of £100, all at once, the board threatened them with other summonses. He then referred to what he considered were fatal objections to the information, and contended that it was essential to the case for the prosecution that the constitution of the board should be proved, their authority to appoint an examiner depending thereon, and he quoted the 29th section of the Gas-Works Clauses Act, 1871. He also urged the necessity of the prosecution proving the registration of the company, as at present it was not shown in evidence that there was any such body as the Fleetwood Gas Company, and, consequently, there was no defendant before the bench. From their long experience of such matters, he was sure the magistrates would be aware that the first step to be taken was to produce the certificate of registration, which Mr. Ascroft could have obtained by giving notice to the company to produce it. This omission, he submitted with great confidence, put Mr. Ascroft out of court, and if the bench were with him on that point, he would not go any further.

Mr. ASCROFT said that, by the Provisional Order of 1873, it was enacted

that the Fleetwood Gas Company were the undertakers, for the purpose of the Act of 1871, under which these proceedings were taken.

Mr. BEASLEY said the order did not place the company on the same footing as corporations, as far as powers were concerned. The Board of Trade, who made the order, did not trouble themselves to inquire whether the parties applying for the order were a corporation or not. The order might be granted to an individual, and it was not necessary that there should be a company. When confirmed by an Act, the order conferred upon persons obtaining it the powers of associated companies having a special Act, with regard to the gas supply, but it did not alter the constitution of the company, and did not constitute them a corporation; therefore, his objection had not been answered at all. He then resumed his objection to the validity of the examiner's appointment, and quoted the words of the 29th section, to the effect that the local authority "may appoint and keep appointed a competent and impartial person to test the gas." Under these terms, it was necessary for Mr. Chew to produce his appointment.

Mr. ASCROFT said the local board had full power to appoint, under the 29th section of the Act of 1871. The 30th section required the appointment to be in writing, but that applied to the appointment by the justices, and not by the local board, who were not bound to make the appointment in writing. The proceedings of the board were published throughout the district, and it was no excuse that the company did not know what was going on.

Mr. BEASLEY said it was necessary to give the examiner a written statement, so that the manager might know the ground on which the test was to be made. The report of Mr. Chew was quite sufficient to put the local board out of court. Mr. Chew had admitted that the envelope produced was the one in which he enclosed one of the reports. The date of its being posted was October 26th, and the date of its receipt was the 27th. Referring to section 33 of the Act, he said it was provided that the gas examiner should, the day following his test, make and deliver a report of the testing to the local authority and to the undertakers. The proceedings were of a penal character, and it was necessary that the sections bearing upon them should be literally construed. The defendants were entitled to the strictest possible proof, and to the benefit of any doubt in the minds of the magistrates. He therefore submitted that the local board were out of court, because the offence was alleged to have taken place on the 25th of October, when the test was made, and the report was not delivered to the company until the 27th. The board were not entitled to take proceedings against them, because they had not complied with the requirements of the Act of Parliament. It was also necessary that the test should be made between the hours of five and ten o'clock p.m., and there was nothing in the document to show at what time the test was made, and this was very important, because the gas might be perfectly good at five and very bad at six.

Mr. ASCROFT having replied to the objections raised, the magistrates retired, and after an absence of some minutes they returned into court, and

The CHAIRMAN said they were unanimously of opinion that the local board had proved the case.

Mr. ASCROFT: You will allow me to call evidence as to the state of the gas previously, before you fix the penalty?

The CHAIRMAN: We do not think it necessary for you to say anything else. You have fully vindicated the summons; it is a very bad case indeed, and we are both of opinion that the gas company should be fined the maximum penalty of £20.

Mr. BEASLEY applied for, and was granted a case on any one of the points raised.

Mr. ASCROFT said there were four other summonses—two for impure gas, and two for deficient pressure, and he was instructed to proceed with the latter.

The CHAIRMAN suggested that, as the local board had obtained the full penalty in one case, they should waive the others.

Mr. ASCROFT said he was willing to withdraw on payment of costs, which were included in the penalty in the other case.

The CHAIRMAN thought the local board would be satisfied with the costs of the summonses.

Mr. BEASLEY said he was confident he could produce evidence that would justify the bench in dismissing the summons relative to the pressure.

Mr. ASCROFT said he was quite prepared to go into the case.

The BENCH made an order for payment of the costs in the other cases.

Mr. BEASLEY said he was prepared to pay the penalty and costs, without appealing to a higher court. He expressed his regret at hearing that things had been so bad at Fleetwood, and said he had given instructions to the company to turn out of the holders every foot of gas and obtain a fresh supply, which he hoped would give greater satisfaction.

WORSHIP STREET POLICE COURT.—MONDAY, NOV. 8.

(*Before Mr.* HANNAY.)

COMPLAINT UNDER THE METROPOLIS WATER ACT, 1870.

The East London Water-Works Company appeared on an adjourned summons to answer a complaint made by James Grimes, between whom and the company a certain dispute existed, in order that such dispute might be adjudicated upon. The former hearing was reported in the JOURNAL of the 5th ult., page 504.

Mr. ST. JOHN WONTNER appeared for the complainant, and Mr. GLYNN, barrister, for the company.

Complainant carried on business as a publican's plumber and bar-fitter in Osborn Street, Whitechapel. His complaint was that, about the month of August last, the company's inspector visited his place in his absence, said that certain fittings, particularly one called a "waste preventer," were necessary to the closet-tanks, and when the servants of the complainant, in his absence, refused to allow the company's men to cut away the pipes and cocks then fixed, the man in charge refused to wait, said that his orders were to stop the supply, and accordingly the communication was cut, and the complainant was without water many days. The company, in June or July previously, sent a notice to the complainant, among others, stating that it was proposed to give to the houses a continuous supply, and for this purpose certain apparatus would be necessary; but one rule laid down by them at the time was, that, where the fixtures for the supply were perfect and satisfactory, they would be allowed to remain. The apparatus proposed to be furnished would cost, it was said, £12 or £14. The complainant averred that no fault had ever been found with his fittings, which were annually inspected; that, shortly before the cutting off, he had gone over the matter with one of the inspectors to the company, who had allowed everything to be satisfactory, and only required that a screw ferrule should be put on the pipe communicating with the main. This the complainant had had done by the company's men at his charge, yet they cut his water off in his absence, and left him liable to prosecution by the sanitary authorities. The former hearing was before Mr. Bushby, but the matter was now reheard *de novo* before Mr. Hannay. In the course of the hearing, it was stated that the company sold to the complainant at their office a copy of the rules, &c., under which the water was to be supplied. They now repudiated this as not being correct. The rules were not stamped or certified by the Board of Trade, as required by the Act, which directed that such rules should be sold to all persons requiring the same. It was argued that the company were required by the Act to give notice within 48 hours to the sanitary authority of the district in which they cut off the water, and this they had not done.

After hearing the case at some length,

Mr. HANNAY said he had come to the conclusion that the rule as to the old fittings being sufficient, if perfect, did not apply in this case, and that he must dismiss the complaint. It was in the nature of an arbitration, and there would be no order.

Mr. WONTNER hoped that the public would know what to expect from the water companies.

Mr. HANNAY thought it would be difficult for them to learn, unless they waded through half a dozen Acts of Parliament and the companies private Acts.

WANDSWORTH POLICE COURT.—FRIDAY, NOV. 12.

(*Before Mr.* INGHAM.)

STAMPS ON GAS CONSUMERS CONTRACTS.

William Henry Crunden, of Grant Road, Clapham Junction, was summoned by the London Gaslight Company for an amount due from him for the supply of gas to 45, Culvert Road, Battersea.

Mr. JONES, who defended, took an objection to the contract which was produced, as it was not stamped.

Mr. INGHAM said every contract must be stamped, unless there was some exception to it.

Mr. DOVE, who represented the company, referred to the Act, but was unable to point out any exemption from the general law.

The *defendant* was sworn, and said that the gas was supplied to his successor.

Mr. INGHAM pointed out to Mr. Dove that he must show the defendant contracted to pay for all gas supplied to the house in the Culvert Road. In this case the contract was indispensable; but then Mr. Jones said it was not admissible.

Mr. DOVE said the contracts had been admitted before. He asked the magistrate to adjourn the case.

Mr. INGHAM granted an adjournment, and said if Mr. Dove failed to prove the case he would have to pay Mr. Jones a guinea costs.

DUBLIN POLICE COURT (SOUTHERN DIVISION).—NOV. 5, 6, AND 8.

(*Before Mr.* DIX *and Mr.* C. J. O'DONEL.)

CHARGE OF GAS STEALING.

Edward Fitzgerald was charged, in the first instance, with being drunk while in charge of a licensed public-house, No. 102, Bride Street, on the 28th ult., when a serious fire had broken out in the shop of said house, whereby, owing to the negligence of accused, through his being so incapacitated by drink, the lives and property, not alone in that house, but in the adjoining houses, were endangered.

On the case being called on,

Mr. MARTIN, who appeared for the Alliance Gas Company, asked to have the charge amended, so as to prefer a more serious charge against the defendant. He said that the defendant, who had a supply of gas to the house from the company, having failed in payment, the company's inspector cut off the gas supply. As, however, the defendant had represented that he expected to be shortly able to pay his account with the company, the inspector, as directed, cut off the gas at the pipe inside the counter, carefully sealing the severed section to prevent a flow of gas, and possibly an explosion. On the evening in question, it appeared that Fitzgerald wrenched off the cap placed on the pipe for the purpose of obtaining a supply of gas, evidently expecting to be able to place it there again, so that nobody might know; but on the removal of the cap the gas flowed out, while a man named Downs, who had been applied to for a wrench to remove the cap, was standing by with a lighted candle. The result was the breaking out of a fire immediately. It would be shown that Fitzgerald was aware of the cutting off of the gas by the company's officer, and that the gas which he was appropriating was not his, but the property of the company.

After some conversation, the case was adjourned till the following day, when another adjournment was applied for and granted.

On the 8th inst., when the case was called, it was stated that the defendant had not communicated with his solicitor since the adjournment, and that he was not then present.

Mr. MARTIN said he would examine some witnesses in support of the case, and would then ask that a warrant should be issued for Fitzgerald's arrest.

Mr. *Edward M'Loughlin*, a collector in the employ of the company, deposed to having called on the defendant at 103, Bride Street, on the 23rd of October, for payment of an account due for gas. He handed defendant a notice, intimating that if the account was not paid before the 26th, the gas would be cut off. The account was not paid, and on the 28th witness called on him, accompanied by a workman, and cut off the gas under the counter in the shop. The defendant then observed that it would be very inconvenient for him to be without gas.

Charles Kavanaah, the workman who accompanied the last witness, gave corroborative evidence as to the cutting off of the gas.

Patrick Downs, gas-fitter, Bride Street, deposed that the defendant called on him on the night of the 28th of October, and told him there was something wrong with the gas-pipes in his shop; witness went down with him, and while in the shop defendant got a wrench from him and went behind the counter; after a few moments Fitzgerald asked him to come and help, witness went round behind the counter to do so, when a volume of gas rushed out of the pipe which had been broken and coming into contact with the candle held by Fitzgerald became ignited and set fire to the place.

In reply to Mr. DIX,

Mr. MARTIN said the pipe was capable of conveying 2000 feet of gas per hour, and that, from the time the gas was burning during the fire, about a quarter of an hour, over 500 feet had been consumed. He contended that, although the lighting of the gas might have been accidental, yet there was a deliberate intention on the part of the defendant to renew the connexion of the company's pipes with those in the shop, thereby causing an escape of gas, which amounted to a larceny.

Mr. Dix issued a warrant for Fitzgerald's arrest.

ABERDARE LOCAL BOARD.—The tender of Messrs. Chandler and Sons, of York Road, Southwark, has been accepted for about 23,000 yards of pipe-laying.

THE SUICIDE OF A GAS MANAGER.—An inquest was held at Norwich, on the 6th inst., by Mr. Bignold, the coroner, touching the death of Mr. Chandler Tadman, late manager of the British Gas Company's works in that city, who committed suicide on the previous day by shooting himself with a pistol. Deceased, who has left a family of five children, was 49 years of age. After the facts had been proved and evidence given that the unfortunate man had latterly exhibited symptoms of a disordered mind, Mr. Arthur Preston, solicitor, said he wished to state on behalf of the company how deeply they deplored the ultimely death of Mr. Tadman, who had been connected with the company for so many years, as likewise his father before him. There was no suspicion at present that there had been any defalcations on the part of the deceased; and this, he was sure, would be very satisfactory to his friends and the shareholders of the company. Of course, he could not go into the deceased's private affairs. He simply wished to express the satisfactory feeling that there had not been discovered anything in the shape of defalcations; in fact, it would be almost impossible for this to be so, for their system of keeping accounts was so very strict, that anything of a suspicious nature would be almost sure to be detected. The jury were satisfied with the evidence they had heard, and brought in a verdict, "That the deceased came to his death by shooting himself with a pistol, being at the time in an unsound state of mind."

Miscellaneous News.

METROPOLIS GAS SUPPLY.

Dr. Whitmore's report on the illuminating power, pressure, and quality of the coal gas consumed in the parish of Marylebone during October :—

1875.	Illuminating Power in Sperm Candles.			Mean Pressure in Tenths of an Inch.		Mean Quanty. of Sulphur in 100 Cu. Ft.	Mean Quanty. of Ammon. in 100 Cu. Ft.	Sulphuretted Hydrogn.
	*Mean of 24 Obser.	Highest.	Lowest.	Highest.	Lowest.	Grains.	Grains.	
Imperial Comp.'s gas	16·18	16·70	15·74	23·10	8·60	17·97	0·56	No trace
Chartered Comp.'s common gas	16·27	17·01	15·34	28·61	15·00	12·86	0·49	No trace
Chartered Comp.'s cannel gas	20·17	20·91	19·21	19·57	11·22	15·42	0·83	No trace

Mean of daily readings of barometer . . . . 29·48
" " " thermometer . . . 60·35

* Each observation consists of ten readings of the photometer, at intervals of one minute.

During the month the mean illuminating power of the Imperial Company's gas was equal to the light of rather more than 16 sperm candles; it ranged between 15·74 and 16·70 candles. On four occasions only was it below 16 candles. The mean quantity of sulphur formed in 100 cubic feet of this gas was 17·97 grains, and of ammonia half a grain. The mean light of the Chartered common gas was equal to 16½ candles; it ranged between 15·34 and 17 candles; three times only was it below 16 candles. The mean quantity of sulphur found was about 13 grains, and of ammonia rather less than half a grain. The cannel gas gave a mean light equal to rather over 20 candles; it ranged between 19·21 and 20·91 candles; five times it was below the standard of 20 candles. The mean amount of sulphur in this gas was 15·42 grains, and of ammonia 0·83 of a grain. The pressure of the Chartered Company's gases was good, but that of the Imperial Company's gas was often low, and complaints have been made to me by householders of the insufficiency of their light, which complaints I have transmitted to the proper official of the company. On no occasion was sulphuretted hydrogen detected in either of the gases by the ordinary tests. The above results were obtained from the gas manufactured by the Imperial Company at their Fulham works, and from the Chartered Company's gas manufactured at their works, Beckton and Bow.

METROPOLIS WATER SUPPLY.

Dr. Whitmore's report on the composition of Thames companies and other waters supplied to Marylebone during October :—

1875.	Total Solid Matter in degrees or grains per Imperial gallon.		* Loss by incineration of Solid Matter in previous column.		Hardness before boiling, in degrees.	Hardness after boiling, in degrees.
	Oct., 1874.	Oct., 1875.	Oct., 1874.	Oct., 1875.		
Distilled Water . . .	0°	0°	0°	0°	0°	0°
West Middlesex water .	19·04	19·28	0·88	0·72	12·91	2·91
Grand Junction water. .	19·80	21·12	0·92	0·88	13·96	3·04

* The loss by incineration represents the amount of organic and other volatile matters contained in the Imperial gallon (70,000 grains) of water.

During the month the water supplied to the parish by the Thames Companies was generally bright, clear, and well filtered, and as compared with the supply in the corresponding month of last year, there was a sensible reduction in the amount of its organic impurity.

The Registrar-General publishes the following return of the average daily quantity of water supplied by the London Water Companies, during the month of October, 1875. According to their returns 117,744,887 gallons, or 534,969 cubic mètres of water (equal to about as many *tuns* by measure, *tons* by weight) were supplied daily; or 226·0 gallons (102·7 decalitres) rather more than a *ton* by weight, to each house, and 31·8 gallons (14·4 decalitres) to each person, against 31·9 gallons during October, 1874. According to returns of the London Water Companies made to the select committee on East London Water Bills (session 1867), it is estimated that, during the year 1866, about 82 per cent. of the total supply of water for all purposes was for domestic use; applying this proportion to the total quantity supplied daily in the month of October, 1875, it may be estimated that about 96,550,807 gallons were used for domestic purposes, or about 26·1 gallons per day for each inhabitant, against 26·2 in the corresponding month of last year. This proportion varies from month to month, but the Registrar-General has no means of giving a more reliable estimate.

Companies.	Number of Houses, &c., supplied in Oct., 1874.	Oct., 1875.	Aver. Daily Supply of Water in Gallons* during Oct., 1874.	Oct., 1875.
Total supply	513,520	521,077	116,336,586	117,744,887
From Thames	241,240	245,194	60,105,677	60,015,458
" Lea and other Sources . .	272,280	275,883	56,230,909	57,729,429
THAMES.				
Chelsea	28,467	28,600	7,861,500	7,327,600
West Middlesex	46,363	47,330	9,335,685	9,565,832
Southwark and Vauxhall . . .	79,808	80,270	18,952,780	19,000,260
Grand Junction	35,144	36,036	10,953,511	11,015,726
Lambeth	51,458	52,958	13,002,200	13,106,100
LEA AND OTHER SOURCES.				
New River	122,660	123,862	26,931,000	27,271,000
East London	106,459	107,851	22,853,000	23,953,500
Kent	43,101	44,170	6,446,909	6,504,929

* Including that for manufactures and for various purposes other than for domestic consumption.

Note.—The return for October, 1875, as compared with that for the corresponding month of 1874, shows an increase of 7557 houses, and of 1,408,301 gallons of water supplied daily.

Dr. Frankland, F.R.S., as the result of his analysis of the waters supplied to the metropolis during October, reports, that taking unity to represent the amount of organic impurity in a given volume of the Kent Company's water, the proportional amount found in an equal volume of the water supplied by each of the other Metropolitan Companies was—New River 1·5, Grand Junction 2·0, West Middlesex 2·4, Southwark 2·5, Chelsea 3·1, East London 3·3, and Lambeth 4·1. The best river water was supplied by the New River Company from the Lea, but the water delivered both by the West Middlesex and Chelsea Companies was not much inferior in quality, and had been efficiently filtered. The Thames waters, supplied by the Grand Junction, Southwark, and Lambeth Companies, were slightly turbid, those of the two last-mentioned companies containing "fungoid growths;" the Southwark water also contained "moving organisms." The Kent Company's deep-well water was of the usual excellent quality.

LOWE'S NEW PROCESS OF GAS MANUFACTURE.

Mr. G. L. Dwight, of Mont Clair, N.J., sends the following description of this process, which is now in practical use in Utica, N.Y. :—

In general terms, the product is the result of a decomposition, by heat, of water and crude petroleum, but it is as different, in its character and quality, as the method by which it is produced differs from all others.

The system of retorts or equivalent vessels, heated externally, has been in all other methods in some degree adhered to. In this, however, it has been entirely abandoned, and the materials for decomposition are introduced directly into the fire itself, by which means there is secured the greatest possible economy of heat; while certain constituents, ordinarily wasted, are utilized as fuel, some being burned, which in other processes are carried forward with no advantage to the product. However trivial this difference of principle may appear, it is proven to be radical by the accomplishment of important differences in result. No other residuum than pure ashes in drawn from the generator. This generator is substantially a small cupola furnace of about 3½ feet internal diameter, built of fire-brick, with air space between double walls, which is charged with anthracite to a depth of 3½ feet, and driven to the proper heat by a blower. The draught is carried into the base of, and upwards through, a second cylindrical chamber, much like the first, but higher and filled with fire-brick laid up with interstices, through which the gases of combustion are carried and ignited, evolving a high temperature. When suitable heat is attained (a dull cherry red in the generator, and a white in the superheater, as the second chamber is termed) the base is closed against atmospheric air, the valve passage to smoke stack shut, and dry steam is admitted directly into the incandescent coal, a little above the grate bars, while crude petroleum is dropped from above upon the same. The gases, therefore, are generated in the same vessel at the same moment, and pass together into the secondary chamber.

It will be remarked that the mass of coal is gradually being cooled by the passage through it of the steam; but as the gases escape from the furnace very hot, they do not greatly diminish the heat of the second chamber, which, by its uniformity and height of temperature, equalizes and thoroughly fixes the product. Thence it passes, through the washing and condensing apparatus, onward through the lime boxes to the holder.

In practice at Utica, which is the largest place yet lighted by this system, two generators are employed (though four were set up), being used alternately. No. 1 is heated while No. 2 is making gas, and so on, so that continuity of production is ensured. One generator is used for 30 minutes, and then another, this length of time being, on the whole, the most economical, as the fire is not, during that period, so far checked as to involve delay in refiring. The mass is then stirred slightly with an iron rod, a small quantity of coal added, and the blast reapplied. Each run gives an average of 3000 cubic feet. The management of the apparatus is stated to be exceedingly simple, requiring no skilled labour beyond a little experience in judging of heat and in the gauging of the oil flow. In the Utica works, two men by day and night, at labourers wages, make all the gas required by that city, the coal system having been for some months entirely superseded. Continuous daily operation there has clearly demonstrated that 60 lbs. anthracite, costing 6 dols. per ton, and 3 gallons petroleum, costing 6 cents per gallon, yield 1000 cubic feet of gas, which, with the labour and time added, makes a cost in the holder not exceeding 50 cents per 1000 cubic feet, for gas of a quality not less than 20 candles. No difficulty is found in maintaining a uniform standard, and no indication of stratification or of deposition in the pipes is met with. The flame is remarkably white and intense, and its combustion perfect. Extreme experimental tests, or (better still) the practical experience of the past winter, at Phœnixville, Pa., where the thermometer sank to 17° below zero, have shown conclusively that this product is less sensitive than coal gas. Mr. Dwight considers himself justified, by the facts, in claiming for the Lowe process the following advantages over all others:—

1. Great simplicity of apparatus, and consequent low first cost.
2. Solidity of mechanical construction, whereby the minimum of wear and tear is secured.
3. Ease of management, which largely reduces the labour.
4. The comparative cheapness of materials employed, and their thorough utilization.
5. The high quality of the product, and, for the above stated reasons, its very low cost.—*Scientific American.*

COLOGNE GAS AND WATER SUPPLY.—It was reported in London last week that the Corporation of the City of Cologne will shortly issue a new loan of six million marks, for the purpose of building new gas and water works. The loan will bear interest at 4½ per cent., and be issued at par. A sinking-fund of 1½ per cent. will also be formed.

GAS EXPLOSION AT ROCHESTER.—On the 2nd inst., between five and six o'clock in the evening, a fire broke out at the Two Brewers public-house, Eastgate, kept by Mr. G. Boucher, occasioned by a leakage of gas. Immediately the escape was discovered, Mr. Boucher went into the cellar with a lighted candle, when an explosion occurred, the place being enveloped in flames. The volunteer fire brigade were promptly on the spot, and the fire was speedily extinguished. The shock, occasioned by the fire, was so severely felt by Mr. Boucher that he expired rather suddenly on Thursday evening, never getting over the fright. Mr. Boucher was 72 years of age.

OLDBURY GAS SUPPLY.—A public meeting was held in the People's Hall, Oldbury, on the 10th inst., for the purpose of considering the advisability of purchasing from the Birmingham Corporation the gas-mains in the district. Mr. B. T. Sadler, chairman of the local board, presided, and said that the meeting was convened to see in what way they could best get out of the "books" of the Birmingham Corporation before next session of Parliament closed, otherwise they would lay upon posterity such a burden as would never be got rid of. They had several reasons for purchasing their own mains, and making their own gas; the foremost of which was that they could not trust the Mayor of Birmingham, nor could they agree with the corporation of that town. After a lengthy speech by the chairman, Mr. Stableford moved a resolution to the effect that the ratepayers of Oldbury at once take steps for going to Parliament next session for a bill empowering them to purchase the mains now within this district, and erecting works for the manufacture of gas. The Rev. Mr. M'Kean seconded the motion. Mr. Hindes, a member of the local board, considered that the Mayor of Birmingham had met their views in every possible manner. He was neither crafty nor dishonest. If the few gas consumers of Oldbury would allow themselves to be guided by the numerous consumers of Birmingham, they would find it to their advantage. He (Mr. Hindes) showed that the terms offered by Birmingham would enable them to obtain gas at a less cost than many towns in the district were now paying. The Oldbury Local Board had already spent £850 in opposing the gas bill, and if they promoted a bill of their own they would have to half ruin themselves to do it. The opposition to the Corporation of Birmingham seemed to be entirely a matter of jealousy. He trusted the ratepayers of Oldbury would be thoughtful, and consider twice before they further opposed that body. A number of gentlemen having supported the resolution, Mr. Hindes proposed an amendment—"That we proceed no further in this enormous undertaking." Mr. Orton seconded the amendment. On being put to the meeting, the original motion was carried by a large majority.

BURNLEY CORPORATION GAS-WORKS.

Revenue Account, for the Year ending June 30, 1875.

Dr.				*Cr.*			
Manufacture of gas—				Sale of gas, per meter—			
13,965 tons of coal and cannel, including expenses for carriage and unloading	£12,721	17	8	109,914,000 cubic feet	£16,947	8	1
Salaries and wages	2,104	3	10	Public lamps	1,951	2	11
Purification, including labour	347	2	5	Rental of meters	1,048	17	1
Repair & maintenance of works	1,428	5	6	Residual products—			
Distribution—				Coke sold	2,600	13	0
Maintenance of mains	452	11	11	Tar and ammoniacal liquor sold	714	16	1
Salaries and wages	407	4	9	Spent lime sold	49	8	7
Repairs and renewals of meters	122	8	9	Sulphate of ammonia	1,139	19	6
Lighting and repairing public lamps	264	5	5	Mortar and sundry sales	145	5	8
Rents, rates, and taxes	472	10	9	Rent of cottages and warehouse	123	4	7
Management—				Profit on fittings	183	14	8
Salaries, clerks, and collecting	376	0	8	Discounts and abatements	1	5	10
Stationery and stamps	80	10	2				
Law charges, insurance, and premiums	6	19	6				
General charges	166	16	4				
Bad debts made previous to 1861	257	0	6				
Manufacture of sulphate of ammonia	485	11	0				
Rebuilding retort-bench	876	15	10				
Total expenditure	£20,570	5	0				
Interest & sinking-fund account	2,070	14	1				
Borough-fund account	910	6	6				
Depreciation account	1,352	10	5				
	£24,903	16	0		£24,903	16	0

Capital Account.

Loan from borough department	£31,305	13	6	Cost of plant to June 30, 1874	£78,689	1	2
Loan from commissioners of public works	1,350	0	0	Expended this year	1,733	6	5
Gas deposits in hand	1,349	0	0	Stock of cannel, coal, and stores	6,636	10	11
Sundry creditors	1,632	0	1	Amount due for gas and fittings	3,554	12	8
Depreciation-fund, June, 1874	24,470	5	7	Sundry debtors	23	15	9
Depreciation added this year	1,352	10	5	Balance in treasurer's hands	6,140	5	8
Surplus account	34,503	8	11				
Sinking-fund	614	14	1				
	£96,777	12	7		£96,777	12	7

THE SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The First Quarterly Meeting of the Members of this newly-formed Association was held at the Bedford Hotel, Southampton Row, London, on Thursday last, the 11th inst.

The following is a list of the officers of the Association:—

President—Mr. A. H. Wood, Hastings.

Treasurer—Mr. James Eldridge, Richmond.

Committee—

Mr. Packham, Kingston-on-Thames.
Mr. Parlby, Aylesbury.
Mr. Scott, Tunbridge Wells.
Mr. Price, Hampton Wick.
Mr. Broadberry, Tottenham.
Mr. Martin, Barnet.

Secretary—Mr. J. L. Chapman, Harrow.

The meetings of the association are intended to be held in London on the second Thursday in the second month of each quarter.

At the meeting on Thursday last, the PRESIDENT delivered the following address:—

Gentlemen,—When I was first asked to take part in the formation of the Southern District Association of Gas Engineers and Managers, I had only one objection. It was not that I questioned the propriety of such a society, or that I hesitated as to whether sufficient members could be found to make it a success—on these two points I was perfectly satisfied; but the point that struck me was, whether it would in any way be viewed as inimical to the parent society. I am so satisfied of the widespread usefulness of the British Association of Gas Managers, of the ever-increasing value of its annual gatherings, and of the great benefit that those meetings are to the gas world at large, that nothing would have induced me to have given even the semblance of support to anything that could not run side by side with the parent society, and offer it any humble aid that may perchance at any time lay in a smaller society's power.

And, in making this remark, I am quite sure I have the support of all who have been instrumental in floating the new association. The object is not in any way to withdraw support from the British Association, but to cover ground dependent on local circumstances, which is too minute for the other society to give its detailed attention to. There are circumstances associated with the manufacture and distribution of coal gas which are purely of a local character, and these require local investigation and discussion. I do not mean to say that we shall not discuss matters of a scientific character as well (for, I am pleased to say, we are already promised one paper of a very valuable character for our next sitting), but still I cannot help feeling that local and commercial matters will form great features in our meetings; and should we be fortunate enough to produce anything of a scientific character worthy the acceptance of the parent society, I am quite sure we shall always be most happy and proud to offer it to them.

Nor is the object of the members of the association in any way to combine for the interest of gas managers, apart from the interest of the gas companies and their consumers. I am quite at a point that a gas manager serves himself to his permanent interest only when he serves his company well. And I am equally positive that he serves his company only well when he serves their consumers well. I do not say, to the consumers entire satisfaction, for this, I apprehend, would be a most difficult task; but I do say his object should be in every possible way to serve the consumers, so that they can find no legitimate fault, or be able to suggest any possible improvement. A gas company is of sheer necessity a monopoly, but that monopoly will be best worked for the company when it is worked on the same principle best calculated to secure success, did such monopoly not exist. And I have ever felt, and still feel, that the interest of the company—that of its manager and that of the consumer—is so intertwined the one with the other that, if one strand is overstrained, the others are sure, more or less, to feel the effects.

Our meeting together, then, is in no case, or in any degree, of a hostile character to any person or society; we meet first for the mutual counsel, benefit, and instruction of each other, to discuss the many topics (some of them of a very delicate character) which are continually cropping up in the gas world, and especially in our own districts, believing that, as iron sharpeneth iron, so a man sharpeneth the countenance of his friend; and feeling that we cannot meet for such mutual conference without some advantage accruing from it, which must ultimately result to the advantage of the companies we severally have the honour to represent, and also the consumers we have to serve.

Perhaps the most important question that both companies and consumers are equally interested in is the price of gas. Never was there a time in the history of gas lighting when this subject so occupied the public mind as in the last three or four years. From the beginning of the year 1872, when coals began to rise to a serious price in the market, until the present time, considerable agitation has been going on about the price of gas. Idiots by the waggon load could be found at the early part of this agitation, who stated that the price of coal had nothing whatever to do with the price of gas, that gas ought to be made just as cheap, if not cheaper, than ever, because the residual products made up, or more than made up, all the difference in the price of coal; and, after coal began to go down a little in the market—say 10 or 20 per cent. of what it had risen—then these same people turned round and demanded reductions in price, on account of the trifling reduction in the cost of the raw material; in fact, whatever was the state of the market, whether coal went up or came down, and whether residuals were of more value or less, the cry was equally the same, always one tone, the cost of gas was but a trifle, and the charge to the public ought to be less.

Now, there is one point in reference to the price of gas that I think it would be well to consider for a few moments, because it is always the cardinal point on which the professional agitators lay so much stress, and this point is the difference charged at different places per 1000 cubic feet, or, as I believe it is at present in London, the difference in price in neighbouring parishes, or even in adjoining streets; and it is argued that if gas company A can charge 3s. 9d., why does gas company B charge 4s.; or if, in the provinces, gas company C charges 4s. 3d., why does gas company D charge 5s. per 1000 cubic feet?

Now, this is a question which opens a very wide field of argument, and I fancy it is much more fit for a paper and discussion at a future day, than for me to attempt to meddle with on the present occasion. Still, I think I shall be pardoned for throwing out two or three observations on the subject.

Of one thing, however, I am quite certain, and that is that the day is very far distant when we shall see a universal price charged for gas throughout the country. What may come to pass in the great metropolis I will not venture to prophesy. Whether the present proposition will accomplish its object or not I am not prepared to say; but this one thing I am at a point about, that so varied are the circumstances of provincial gas companies, so different are their proportionate capitals, so wide is the margin as to the cost of the raw material, and sometimes wider still is the value of the residual products, that an universal price is almost impossible, and, to say the least of it, most remote.

Now, leaving the question of proportionate capital, which frequently varies the price of gas from 6d. to 1s. per 1000 feet on the maximum dividends, let us inquire a little into the cost of the raw material. We will first of all imagine a gas-work in the Midland Counties, or the North of England, and I suppose such a company would get their coal at present delivered into the factory at something like 12 per ton. Now, this would represent for the raw material about 1s. 6d. per 1000 cubic feet, subject to the deductions for residual products, which I will not here mix with this calculation. Now, we will suppose another work situated on the Thames. This work, which we will term No. 2, has freightage, wharfage, lighterage, &c., to pay, in addition to No 1, which will not be much less than 8s. per ton; it may not be exactly the difference, but each one can vary the proper difference for himself; but, for argument sake, say 8s. Now, here is an extra cost for raw material of about 1s. per 1000 feet of gas. But we will now suppose another case—an extreme one, I grant, but still within the bounds of facts—and this we will call No. 3. This case has not only 7s. or 8s. per ton freight, but, say, 4s. per ton railway carriage to add to it. And when the coal reaches its destination, is taxed with heavy local dues, perhaps to the amount of 2s. 6d. per ton—making 6s. 6d. per ton in addition to gas-works No. 2, and something like 14s. 6d. per ton in addition to No. 1. Now, how on earth can No. 3 supply gas at the price of No. 2, or No. 2 at the price of No. 1? Much less can No. 3 adopt the price of No. 1. The cost of coal per 1000 feet of gas is 1s. between No. 1 and No. 2, and something like 1s. 9d. per 1000 feet between No. 1 and No. 3; and yet people may be found every day who will tell you that the cost of the raw material has nothing whatever to do with the selling price of gas! Perhaps I ought to remark that the figures I have here used are facts, belonging to localities that I could easily point out.

Nor is it true, because the peculiarities of any particular locality cause the high price of the raw material, that consequently the main residual is of a corresponding value. Coke, more or less, rises and falls in value with the cost of coal, but not in a corresponding ratio. There are many districts where from 25 to 35 per cent. of the coke made cannot be sold at all in the district in which it is manufactured, and, consequently, has to be sold in other neighbouring districts where there are no gas factories, and, therefore, no coke manufactured. In consequence of this, and the expenses (carriage, commission, &c.) associated with it, the average receipts of the coke are brought down very largely, insomuch that I have known the coke receipts of the gas-works quoted as No. 3, come to no more money per ton of coal carbonized than the coke receipts of No. 2, where the coal cost 6s. 6d. per ton less delivered in the factory.

And out of this rises another rather important question, and one, too, which would do well, with a few statistics, for our future discussion. Is it prudent to stack or store coke? And if so, to what extent? No doubt there is a certain amount of deterioration, and then there is the expense of the labour in stacking, which is sometimes no small matter, and to this you have to add the interest of the capital thus locked up; and when all this is done, you have the risk as to whether, at the end of a given time, you will get any more for the coke than you would have done the day you stacked it. Taking all these things into account, I cannot help thinking the most economical, and, certainly, the most convenient mode is, to keep the coke yard as clear as possible month by month. There may be, and I have no doubt are, exceptions to this rule, but I believe they are rare and far between.

Supposing, then, that every means have been taken to induce the residents of the district to consume as much coke as possible, that the price has been well considered, and put as low as will induce the maximum consumption, and that every other means, such as delivery, &c., have been adopted to the best of the company's power, and yet a stock of coke is found to be accumulating, what are the next means for its disposal? I answer, special contracts for outlying districts. That these contracts must be comparatively low, is certain, because the purchaser will have to take them into districts where no coke is manufactured. And there is all the carriage, every business expense, and his margin of profit to be added to it; but still, notwithstanding all these disadvantages, as a last resource, I believe it is far better, and much more economical, than a yard glutted from end to end with great towering heaps of unsaleable coke.

You will, I trust, pardon this digression in reference to the storeage of coke, and we will attempt, just for a moment or two, to return to our subject, with reference to the unavoidable causes which vary the selling price of gas.

And I will tax your patience with only one more consideration, and that is, the difference in price realized by different companies for their tar and liquor. The London companies are much better situated, in this respect, than many provincial ones. It is inconvenient, in many cases, to work up these products, and consequently they have to be sold to some manufacturing chemist; but these are not to be found in every district, and frequently the nearest one is 60 or 70 miles, if not more, away from certain gas-works. This entails such a cost for carriage that I have known the time when the carriage absorbed nearly all the receipts; in fact, many years ago, before the time of railways, the tar made at the works I represent had to be carted into the country and

burnt (and a fine time it was, too, I can assure you, for the boys of the neighbourhood). Nor did the expense of the company end with having to pay the cartage, but two or three times, I remember, they were sued by the neighbouring farmers for injury done to their hedges and grass crops.

Happily, such days as these are gone, and, I trust, gone for ever. Still there remains the fact that distance from a manufacturing chemist means a heavy tax on these residuals, frequently from 1s. 6d. to 2s. per barrel; and these sums, if saved, as they are by companies more fortunately situated, represent a good round sum in the year's revenue.

I will not here enter into some other matters which might be named, such as long lengths of unproductive and yet necessary mains, the difference of wages in different districts, and a variety of other local circumstances, all of which tend to vary the selling price of gas. I think I have said enough to start the subject, and to prove that the price of gas at one place is not a test of what it ought to be at another; in fact, that no straight line can be drawn to fix one unvarying price in the provinces, even if it is accomplished in the metropolis. You might as well try to fix a universal price for mutton chops, or say that tailors shall charge all one given price for great-coats.

Closely allied to this subject is the ever vexatious one of supplying the public lamps. What gas engineer has not had hundreds of inquiries such as these—How many public lamps have you? Who lights, extinguishes, cleans, and repairs? How many hours per annum do they burn? How much gas is consumed per hour? And then the never-failing question—What price is paid for the above by the local board? Why, so stereotyped are these questions, that one often feels he may safely answer the letter before he even ventures to read it. But what does all this prove? Why, if it proves anything, it proves this, that there is an everlasting dissatisfaction existing between the local authorities and the gas companies; if it lulls for a time, it is only like the leaven that subsides in order to heave again the higher; and if one body of councilmen are after a while satisfied, some new aspirant to power is successful in his object on the next Nov. 1, and commences putting everything straight—by first putting every straight thing crooked—and the gas contract is generally a favourite bite for him; but, be this as it may, it is a fact that frequent dissatisfaction exists, resulting in fresh inquiries and new arrangements.

Now, to my mind, it is quite evident this sort of thing ought not to go on. Coal gas has got a commercial value, and there ought to be means of finding out what that commercial value is. The gas company ought not to demand more than a fair value for their commodity, and the local authority ought not to want it for less than that fair value; but the present mode of contracting is by no means a satisfactory way of arriving at a fair arrangement. There are so many considerations independent of the gas itself (such as lighting, extinguishing, cleaning, repairing, interest for the cost of erection, &c.), that it is sometimes difficult to find how much is really paid for the gas itself.

Now, there is but one remedy for all this; and, although that may not be an effectual one, still it will do a great deal towards it, and that is the average meter system. Time was, and in many of our memories too, when nine-tenths of the private consumption was by contract; some burned until eight p.m., some nine, and some ten; very few paid until eleven, although many burned till that hour. Then there was the different sized burner, as well as the different hours of burning; and, altogether, it was the most complete hodge-podge of an arrangement that could ever be imagined, and as unsatisfactory to one party as it was to the other.

But it had ultimately to give way to the meter system, when many of the disagreements between the gas company and the consumer vanished—the one felt they were paid for what they sold, and the other that they had what they paid for; and although misunderstandings still do, and no doubt will, happen under the meter system, yet they are fewer and more easy of settlement when they do occur.

Nor do I doubt but that all the public lighting will be done on this principle sooner or later. Many of the large provincial towns have adopted it; others are just about doing so. Some of the large parishes of the metropolis have entered upon it, and, no doubt, others will follow, and, I am satisfied, with results that will smooth down many of the present disagreements.

Some may say there are difficulties to be overcome as great, or even greater, than those of the contract system. And no doubt there are difficulties to be grappled with in bringing about anything that is new; but still the question should not so much be, "Is it new?" as "Is it right?" And if right, meet any difficulties that may occur, and grapple with them like one who has right on his side.

But it is yet to be proved that the difficulties to be met are great. Of course, every caution should be taken to ensure satisfaction and success; but we have the pleasure of knowing that others have been before us, and we have their experience to profit from; and what Mr. Rutter, of Brighton (a gentleman of no mean authority, be it remembered) has said on the subject is very encouraging to those who are just entertaining it. He says, if he is asked "'How has the average meter system worked?' I answer in one word, 'Well.' We are in our sixth year. During the whole period, and from its commencement, everything has gone smoothly. There has been no hitch—no need for trying to do better, for there has not been anything to amend. There have been no complaints, no disputes, no errors to adjust."

It is not necessary here to argue the mode of fixing the test-meters. Some prefer lamp-columns cast large at the base, with a small dry meter so fixed; and others prefer cast-iron tanks sunk in the ground with larger wet meters. In either case, I have no doubt, a very near approach can be made to accuracy, although I think, for various reasons, I should give the preference to the latter system.

The principle, however, is the one thing I here wish to bring before you; and I think the time will one day come, when burning by contract for the public lamps will be as singular as private consumption by contract is now, and with this hope I will leave the subject.

I will now venture a word or two on the subject of leakage of mains and services. Nothing is more important in the management of a gas undertaking than that there should be permanent arrangements for immediate attention to leaky mains. No matter what the cause of the leak—whether it arises from unsound joints, loose services, or broken mains—it is of the utmost importance that immediate attention should be given to it, whether it occur by night or by day.

It requires no argument on my part to prove this necessity. There were several accidents last winter—two or three of them attended with loss of life, and many others with destruction of property—that speak loudly to us all, that not a moment should be wasted after news of an escape has reached us, but that we should at once set about searching for the cause.

Perhaps I may here be pardoned for a slight digression just to state that I believe a great per centage of bad gas leaks occur from the soil having been removed from under the pipe since it was originally laid, and no one cause has occasioned more serious gas escapes than operations carried on for drainage purposes. The gas-main is often laid quite bare, slung up or propped, perhaps, while the operations are going on, but put out of sight as speedily as possible by the drainage contractor as soon as his work is done. By-and-by the ground settles down, more earth is put on the top, the pipe has but little, and, perhaps, no bearing. The last pound of pressure comes, and the pipe snaps asunder, and our first intimation is, probably, that the gas gets into some dwelling-house to a most serious extent.

In all such drainage operations, the gas company ought to have a representative to see every inch of ground covered in; and in no case should he allow the ground to be so covered until he sees the gas-main perfectly secure by ramming, struts, or some other effectual means.

But, for all this, escapes will sometimes occur, and, when they have happened, they are not so easily discovered. Much depends upon the soil on which the town is built. Unfortunately for me, most of the two towns I represent are built upon shingle, and consequently, if a bad escape occurs, the entire substratum gets charged with gas for a long distance, and the escape may manifest itself most powerfully from 100 to 200 yards from the cause; and I have in this way had as many as 10 or 12 large houses dangerously charged with gas at the same time, while the earth was so full that it several times caught fire, through a spark from the strike of a pickaxe against a flint.

Of course, the most important thing to be attended to in cases like this is to use every endeavour to prevent accident, and frequently it is wise to concentrate attention on this, even in preference to hunting for the escape; and I have found that digging a long trench, deeper than the main, and as near to the buildings as can well be done, to be an effectual preventive. By this means the gas, although still escaping, gets away by means of the trenches, and the houses are kept clear; the trenches not being filled in again until the cause of the escape is found and permanently remedied.

A word or two now with reference to leaky services. There are various causes for these—open seams, untight threads, and bad junctions, &c.; but nothing is more trying than when the services begin to give out from natural decay—in fact, oxidation. This oxidation depends very much upon the soil through which the services have to be laid. If a good firm clay, they may last an almost unlimited time; but if a nasty hungry sand, their life is very short. Sometimes saline qualities in the soil contribute much to their decay; and where salt water is used to water the streets, as it is in some seaport towns, this penetrates down the gully ways, and very speedily destroys the iron. In any case, leaks from services are very trying, for it often happens that what we think a moderate escape from the main is but an accumulation of smaller leaks from the services; and I think we may set it down for a fact that a small leak, and especially an accumulation of small ones, entails much more difficulty in searching for the cause than a large leak in a main does. The large one may be the more serious for a time, but the small one will probably be the more teasing to discover.

It is our misfortune also that wrought iron oxidizes much more readily than cast, hence the more frequent trouble with worn-out services in comparison with worn-out mains.

I think it might be a very profitable inquiry at a future date, if some gentleman will put it in the form of a paper, as to the durability of services as at present put down; also whether or not galvanizing the pipes gives any increased durability. I have heard of lead pipes being used at some places in the room of wrought iron. These must, of course, be supported by something permanent, and it would be a profitable inquiry as to how far these compare favourably with wrought iron, either galvanized or black. Then again services have been laid in wooden boxes or troughs, and thoroughly bedded in tar. This, no doubt, is a great preventive of oxidation, and I think both the expense and the results would be worth inquiry. One thing I am at a point about, and that is that the individual will have the thanks of every gas engineer in Great Britain who invents something in the way of service-pipes as convenient as the present rolled pipes, but which resist oxidation to a much greater extent. I am quite aware these remarks do not so fully apply to every district as they do to some, but where they do apply to their fullest extent, it is of very serious moment indeed.

When a certain district is beginning to show symptoms of the natural decay of the services, as I have named above, I believe the most economical thing to be done is not to fish here and there for leaks, but to take the entire district, and strip and renew every service. I have done this in two or three large districts, and with the best results; but this also might be embodied in the paper I have suggested.

Enough has now been said, perhaps, for the present about the oxidation of wrought-iron pipes on the outside; but I have now a remark or two to make in reference to internal oxidation. It is the practice of builders now-a-days to put in the gas-pipes when they run up their houses (for building them is out of the question). Still, gas is thought of sufficient importance for them to make some provision for it during the erection of the houses, so that with their first advertisement they may add, "gas and water laid on." They know it will not let unless some kind of a provision of the sort is made, and so do something in the way of "laying on the gas."

Now, what do they do? They, first of all, plan where the pipes are to be laid, and then put it out to contract, without any specification as to the pipes at all; or if any specification, the cheapest it is possible to use. And, to make a long matter short, the house is very quickly fitted up from top to bottom with ½ inch, ¾ inch, and 1 inch black iron-pipe of the cheapest quality that can be purchased.

But the worst feature of all this is that the pipes are put in while the house is in progress, and as early as possible, too. Moist mortar is dabbed all over them, everything is wet and damp about them, and there they remain for the whole time of the finishing of the house.

And now what takes place? Why, oxidation is set up inside the pipes before ever they are used; this rust, hanging and dangling in small items all over the inside of the tube, falls down the perpendicular pipes and lodges in the angles. The pressure of the gas sends the same particles of rust along the horizontal pipes to the same angle, and by-and-by a message is sent to the gas company that the pressure is not enough, the meter is out of repair, or that the luminosity is bad; when it is nothing more or less than the fault of the iron pipes—too small, in the first instance, and then so fitted as to induce oxidation being set up at once, to the annoyance of the tenant, and the still greater annoyance of the gas company.

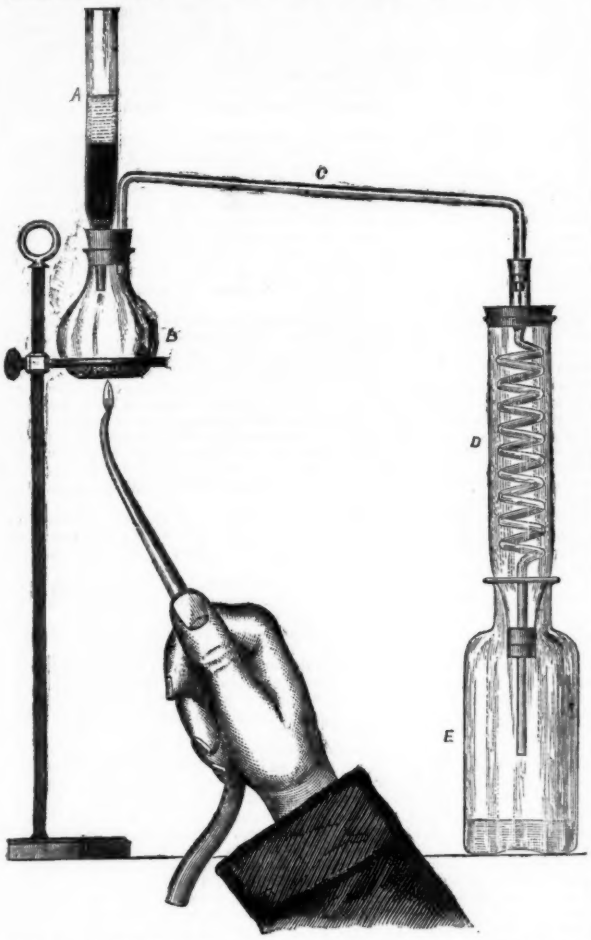
Now, I do not know that this can be altered; but I think it would be well if gas companies and engineers put their shoulders to the wheel, and did what they could to prevent this condition of things going on, to the annoyance of the company and their customers—and for no good whatever but to put money into the pockets of builders and contractors.

There is one matter more which, perhaps, may not be out of place before I conclude, and that is in relation to spent oxide. It was not long ago that this was viewed as but of little, if any, value; but now it is taking the form of a residual worth attention, and, you are all aware, is sold according to the per centage of sulphur which it contains. Now, it is to this very point I wish to pay attention for a few minutes—viz., the estimation of the per centage of the sulphur which the waste possesses. There are several modes of making this estimation, but none, I think, so simple as the bisulphide of carbon test. And there is a little apparatus which has been used for two or three years, which I will briefly describe, even at the risk of repeating what you already know.

The principle on which the test is based is the quality which bisulphide of carbon possesses of washing out the sulphur from the spent oxide, and then leaving it behind, or again evaporating the liquid, by which means you obtain the pure crystals of sulphur of the exact per centage that the oxide contained.

For one moment, then, allow me to direct your attention to this little

drawing of the apparatus. In this little pipette, marked A, is placed a small portion of tow to act as a filter, and on this the quantity of oxide to be subjected to the test is placed. Care should be taken that the oxide is perfectly dry, and every means should be used that it is in every way a fair sample of the lump. A convenient quantity of the spent material is 100 grains, and a perfectly reliable test can be made with this quantity.



Next provide the little flask, marked B; and considerable care should be taken in this preparation, but principally in the weighing. It should be perfectly clean, very thin, and light, and then be accurately weighed, without the cork, with a delicate pair of scales. The pipette should then be placed through the cork as shown in the drawing, as also the small tube C, leading on to the condenser D.

All being thus fitted and properly supported, a small quantity of bisulphide of carbon should be poured into the pipette. This will filter its way through the spent oxide, and drop into the flask below, carrying with it the sulphur which the oxide contains; and by applying a spirit lamp or flexible gas jet (which I prefer) under the flask, the spirit is quickly evaporated, carried along the tube C, condensed in apparatus D, and caught in the bottle E, to be used over again, leaving the sulphur behind in the flask B, which was contained in the oxide.

Judgment must be used as to how long a time the oxide requires washing, but, if persevered in a little, the spirit will soon run paler and paler until it is almost colourless, when it may be safely considered to have washed all the sulphur out of the oxide.

And now as to the results, nothing can be more simple or satisfactory. The flask must again be carefully weighed, and whatever it weighs in grains over and above what it did before, is the per centage of sulphur which the oxide contained, and the residual in the pipette, when properly dried, will make up the difference of the 100 grains. For instance, I will give three or four tests, and I am sure I shall be thoroughly understood:—

1. Experiments.	2. Weight of Flask before Experiment.	3. Weight of Oxide to be Tested.	4. Total.	5. Weight of Flask after Experiment.	6. Weight of Residual Oxide left in Pipette.	7. Total.	8. Differences.
1.	400	100	500	447	53	500	Nil.
2.	420	100	520	470	49	519	1
3.	415	100	515	464	51	515	Nil.
4.	400	100	500	550	48	498	2

Here it will be readily seen that the per centage of sulphur contained in these four samples is the difference in the weight of the flask in No. 2 and No. 5 columns, and is, consequently, as follows:—

No. 1 experiment	. . . . .	47 per cent.
„ 2 „	. . . . .	50 „
„ 3 „	. . . . .	49 „
„ 4 „	. . . . .	50 „

I may here, in conclusion, remark that I have only ventured to bring this forward, because it must be much better for us to test for ourselves, and so know the comparative value of what we are about to sell, rather than for us to be dependent on the purchaser to tell us the value of what he is about to buy.

I have now only to thank you for the great courtesy I have received at your hands, and to apologize for the great want of novelty which I know this address possesses. I have, therefore, to ask you to forgive, and, if you can, forget, also its many imperfections, and to accept my honest desire to serve you in the place of an address more worthy of your acceptance.

On the motion of Mr. ELDRIDGE, seconded by Mr. PARLBY, a vote of thanks was given to the president for his address.

RAMSGATE GAS AND WATER WORKS.

PROPOSED PURCHASE OF THE UNDERTAKINGS BY THE LOCAL BOARD.

A Public Meeting was held at the Town-Hall, Ramsgate, on Saturday, Nov. 6—J. WEBSTER, Esq. (the Deputy), presiding—to consider a resolution respecting a proposed transfer of the gas and water works to the local board.

The CHAIRMAN having read the requisition under which he had called the meeting, submitted the following resolution:—"That the consent of the owners and ratepayers of the urban sanitary district of Ramsgate be, and the same is hereby given, to the promotion by the local board for the said district of Ramsgate of a bill or bills in Parliament, to enable the said local board to acquire, by agreement or otherwise, the gas-works and water-works in their district and the adjoining parish of St. Lawrence, and belonging respectively to the Isle of Thanet Gas-light and Coke Company, and the company of proprietors of the Ramsgate Water-Works, and to make further provisions for a supply of gas and water in the parishes of Ramsgate and St. Lawrence."

The Rev. E. G. BANKS seconded the motion, and in the course of a long speech stated that the proposal involved the possession of two businesses, which together would more than double the income and expenditure of the local board. He submitted several reasons why, on general grounds, the supply of gas and water should be in the hands of the town, and not in the hands of companies. All monopolies must be bad for consumers; but the supply of gas and water must be a monopoly, except in towns of large size. Ramsgate was not large enough to support competing works, and although it might be alleged that such works would be better managed by persons who had a pecuniary interest in them than by the local board, he thought there was this fact to be borne in mind—that the monopoly would always be worked in favour of the shareholders, and the consumers would be made to pay whatever price the company might choose to impose upon them. Having referred to the sanitary considerations which made the proposed transfer desirable, he spoke of the great success which had attended the undertaking of the Isle of Thanet Gas Company. Of course, when people embarked their capital in any business or commercial transaction, provided they carried on that business properly, and without detriment to their neighbours, they were entitled to a fair remuneration on their investment. Parliament had laid it down as a rule that upon capital invested in gas-works 10 per cent. was a fair remuneration. If the directors and shareholders of the Isle of Thanet Gas Company had been content with 10 per cent., he did not know that the inhabitants of Ramsgate would have had much to find fault with; but he would show that instead of receiving 10 per cent., they had been getting 30 or 40 per cent. This money had come out of the pockets of the consumers, who he believed, by their votes that day, would say that such a state of things must be put an end to. The company were formed to supply Ramsgate and Margate; but his remarks applied solely to the former town. The capital the company were empowered to raise was £24,000, an equal proportion of which might be taken as applying to each place. This was the amount of capital the company professed to pay 10 per cent. upon; but as the capital actually subscribed was nearer £7000 than £12,000, the 10 per cent. should have been paid on the £7000, and not on the larger sum, the extra profits going towards a reduction in the price of gas after providing for necessary and permanent improvements. As it was, the shareholders received about 17 per cent. upon the amount actually paid; but the company, as a matter of fact, paid dividends on a far larger sum than £12,000, so that the original shareholders received about 30 per cent. Although the public had thus ground of complaint against the company, he did not think it would be well for the local authority to purchase the works, except on fair terms. The consumption of gas in Ramsgate was about 52 million feet a year, which, at 4s. per 1000, would realize £10,400. The cost of production was about £2170, and the expense of management £3600; the net profits, therefore, would be about £4600. Gas engineers told him that the net profit, when gas was sold at 4s., was 2s. per 1000 cubic feet, and according to that estimate, the profits in Ramsgate should be £5000. Taking it at £4500, if the local authorities acquired the works, and reduced the price of gas from 4s. to 3s., it would leave them with a net annual profit of about £2000. This must be the basis upon which any offer for purchasing the works should be based. They could either offer the shareholders to capitalize these profits at so many years purchase, which would cost the local board about £40,000 or £45,000, or they might guarantee the interest on this amount to the shareholders in perpetuity. The town could borrow money at 4 per cent., and thus have a balance of profits over. He had spoken of the limit of price to which the town might go; but there were many reasons why they should not pay more for the works than £30,000. He urged upon the meeting not to delay the completion of arrangements for obtaining the transfer of both undertakings on the ground that every year would add to the sum at which they would have to be purchased.

Mr. JACKSON having spoken in support of the motion,

Mr. BANKS said Mr. G. W. Stevenson, the eminent gas engineer, was present, and would be prepared to answer any inquiry that might be put to him on the subject generally.

Mr. W. STOKES said he should like to ask Mr. Stevenson if he could quote a single instance where Parliament had granted compulsory powers to purchase either for gas or water to any corporation or local board.

Mr. STEVENSON said he had been in most of the parliamentary contests in which gas and water undertakings had been transferred from companies to local authorities, and he was able to answer the question in the affirmative in two cases. One case was that of Rotherham, in which the gas-works were transferred from the company to the local authorities, at that time, like the Ramsgate local authority, a Board of Health, but since then a municipal corporation. The company promoted a bill in Parliament, and the local board also promoted one in the same session. The bill of the company was thrown out in the first House, and the bill of the local board for compulsory powers was granted. The company opposed the bill in the second House, but Parliament in the second House affirmed the decision of the first, and granted the local board the compulsory powers asked for. That was about five or six years ago, and he had the honour of acting for the local board. Last session the Corporation of Birmingham promoted a bill for the acquisition of the water-works, which were held by a very large company; and, although the company resisted the application for compulsory powers, Parliament in both Houses granted the powers the corporation asked for; and, in both instances, at the present moment, the works were the property of the corporations.

Mr. STOKES said he was not in a position to ask anything further with regard to Rotherham, but he wished to ask, with respect to the transfer at Birmingham, whether the original Gas and Water Acts at Birmingham did not contain clauses empowering the corporation to buy at any time.

Mr. STEVENSON said there were two companies in Birmingham. In the Acts of both of these companies there were clauses authorizing the companies and the corporation to agree for the purchase and sale of the gas-works, but there was no compulsory powers for the corporation to purchase.

Mr. DANIEL was sure that Mr. Stevenson did not wish for one moment to mislead the meeting. He was not going to quote any opinion of his own, but would quote an opinion which he was sure Mr. Stevenson would not dispute. It is the authority of Mr. Denison.

Mr. STEVENSON: I shall dispute it with all the powers I have. Put Mr.

Denison (now Sir Edmund Beckett) on oath, and I will take his evidence most literally and most thankfully; but you know an advocate has been described to be like a sick man—who first lies on one side, and then on the other, and when he is dead he lies still.

Mr. DANIEL: All I can say is I have Sir Edmund Beckett's statement, made only in 1874, which is in direct variance with Mr. Stevenson's.

Mr. E. ELLICE-CLARK, C.E., surveyor to the local board, pointed out that the Isle of Thanet Company, not being under the control of the Gas-Works Clauses Act, were not subject to the excellent restrictions which Parliament then made compelling companies to supply gas of a certain standard of purity and illuminating power, and limiting their profits; and he explained that if the local board promoted a bill in Parliament these restrictions would be enforced. With regard to the water, he stated that although that supplied by the existing company was of excellent quality, the supply per head of the population in April was less in Ramsgate than in any other town in England. He also pointed out that, owing to the high price charged for water, the quantity used for drainage purposes was less than it ought to be, and he contended that the very poor ought to be supplied with this important element at cost price.

The resolution, on being put to the meeting, was carried unanimously.

RAMSGATE LOCAL BOARD.—At the meeting of this board on the 2nd inst.—Mr. Lake Price in the chair—a resolution was adopted to the effect that it is expedient for the board to promote a bill or bills in Parliament to acquire, by agreement or otherwise, the gas and water works supplying the district, providing the consent of the ratepayers be duly obtained for the purpose. The Rev. E. G. Banks, who moved the resolution, was careful to explain that he, and those with whom he had acted as a committee, were in no way associated with a "Gas Consumers Association" which had been formed in the town, but were simply influenced by their desire, as members of the local board, to do their utmost for the welfare of the ratepayers. There was only one dissentient to the proposed bill. A committee was formed to take the necessary steps for giving effect to the resolution.

ACCIDENT TO, AND REPAIR OF, A GASHOLDER IN AMERICA.

We have been favoured by a correspondent with advance sheets of the forthcoming number of the "Journal of the Franklin Institute," containing a graphic account of an accident which recently befell a gasholder and tank erected for the Citizens Gaslight Company, Buffalo, N.Y., and of the steps taken to repair the injury, with a discussion and report upon the subject by Mr. Robert Briggs, C.E., of Philadelphia.

The gasholder in question is a telescopic one, the diameter of the inner section being 88 feet 6 inches, and the height 22 feet; the diameter of the outer section being 90 feet, and of a height of 22 feet. The working contents of the holder are 265,722 feet.

The inside dimensions of the tank are 91 feet 6 inches in diameter, and 22 feet 8 inches in depth. The specification provided that the level of the top surface of curb should be 8 inches above the general level of the ground around the tank; the side walls and piers for columns to be constructed in brick; the bottom and wall footings to be in brick or concrete (or brick with concrete); stone anchor blocks, stone coping round wall, and stone cap for centre pier as described.

The report of Mr. Briggs, attached hereto, furnishes details of such other portions of the specification as are necessary to the understanding of the cause of the accident we are about to narrate.

The work was performed under contracts between the gas company and the Southwark Foundry of Philadelphia, for the holder; and between the gas company and a building contractor of Buffalo, for the tank. Mr. Briggs thus describes the causes and result of the accident.

The time in which the tank was to have been completed, and possession given to the iron workmen having expired, the writer visited Buffalo early in the month of October, and then made the first and only inspection of the tank-work. The lines of the ground, and those for laying out the tank and its column piers, had been given by a local engineer, Mr. Davies, who was indeed amply competent to have had charge of the construction under the specification; but no further duty than the setting out was devolved upon him by the company, the contractor having been permitted to work in his own way, with little occasional supervision from some of the directors.

The ground proved to be a fill of ashes and rubbish of 10 to 12 feet depth, which had been made on a loose alluvial deposit of 5 to 6 feet, and then came 2 to 5 feet in places of compact alluvial, somewhat clayey, to natural surface of rock. The surface of this rock had at one time been the bed of the lake (or rather of the entrance of Niagara River), and rapids must have existed here; the location of the works being about 800 or 900 feet from present shore of the lake The rock bed was very irregular, and eroded by former action of water and ice; and at some places 3 or 4 feet of rock were removed, to give the proper depth at the side of the tank. Elsewhere, in the immediate vicinity where the rock had been uncovered, fissures had been found, and blasting the surface had discovered channels, which were supplied with water from the lake (the surface of which was 5 or 6 feet above the level of the bottom of the tank); but in this place, by great good fortune, no such supply of water was disclosed.

There were, however, several springs of no great moment, which broke out through the foot of the cone of alluvium left in the centre of the tank.

The provisions specifying for under drainage of the bottom had been neglected, and about 70 to 100 square feet of the paved bottom had been lifted by the force of the springs.

It was said that the walls of the tank all around had their foundations on the rock itself, having been carried about 2 to 5 feet at one side below the specified depth for the purpose.

The bank of earth had been improperly shored for the loose material, and extensive caves had ensued, involving the loss of the old retaining wall and the shed, which the additional specification required to be supported. This loss, however, was inconsiderable in amount.

Much delay had followed the caving, and also from the non-performance of some sub-contract for excavation, and the brickwork was three weeks behind. Three weeks after the 30th of November at Buffalo is a serious matter in outside ironwork.

Considering the fact that the loose material was only about 15 feet deep on the average (both fill and soil), it would have been as well to have dug to a slope of one to one at once, and straightened up the sides of the cut, back of the wall, and filled solid in a back trench, thus made after completion of the wall.

There had been a loss of lines incident to the cave, the pier stakes having been unprotected, and a second setting out by the surveyor had been made to correct the shifted piers. The back filling properly had been entirely neglected, and after the rubbish had been deposited 10 or 12 feet high, it was puddled by running in a stream of water by a hose. No iron ties were used, the contractor not deeming them necessary. Perhaps the most radical departure from good tank construction laid in leaving a cartway gap at one place, which was not filled up until after the wall was to its height generally. Nothing but the rock foundation of the wall, and the looseness of the back fill, saved the tank in good shape against such defects in erection.

The bricks were very good, sound, straight, and hard burnt, but the mortar was made from a species of hydraulic lime, which had little or no quality of setting, and only hardened under water in time. It was said to become solid in two or three years, at the end of which time it had the character of our American natural cement of no very high grade.

This condition of the work becoming known to the writer, he at once called the attention of the officers of the company to it, and immediate steps were taken by them to at least ameliorate some of the errors. Many of the defects were beyond correction, but much was done to bring the work more nearly to conform to the requirements of the specification. In one regard attention is called to what was done: the bottom of the tank was cut through in channels from boiling spring to boiling spring (about six or seven places existed when the water boiled an inch or two high amongst the bricks), and under-drains formed to lead to a well at the edge of the bottom. This well, as specified, had a closure or diaphragm plate one foot from the top, with a valve opening upwards in the middle. The drains discharged under the plate, and when the head of the water was strong enough it lifted the valve. This it did without bursting up the bottom.

It follows from this system of drainage that all the springs can, with much freedom, enter the tank as long as the head of the water within the tank does not close the valve, but when the head of water within the tank is great enough to close the valve, no water can run out of it. To make this proposition more clearly comprehended, let it be supposed that the springs in the bottom of a 20-feet deep tank would find their level and fill it 3 feet deep with water. Now these springs must evidently have an overflow somewhere (in this case they had the lake 800 feet distant), and any attempt to fill in water above the level would result in its discharging at the overflow of the springs. The water of the tank would thus empty to a certain level through the same passages that had previously supplied it.

This description has been made so particular, in order to convey the idea of what should be avoided in building a tank. With 25 years experience in construction of gas-works, the writer does not think that one tank out of three which he has had to do with has proved satisfactory. It is with great difficulty that a local house bricklayer can be induced to do hydraulic work. The few men who know how, and have done, Government or dock work are so underbid by those who contract to build, that their opportunities for employment by a gas company are very small. There are three things needed for a tight tank for a gasholder—a good specification, a competent engineer, and a number of skilled bricklayers. The willingness to pay for good work on the part of the gas company, and the honesty of the contractor, are conditions precedent to the construction.

At about four o'clock on Sunday afternoon, Sept. 4, a telegram was handed to me, informing me that the holder had collapsed, and asking an immediate personal visit to Buffalo. At seven p.m. I was on the train for Buffalo, reaching that place at two p.m. on Monday.

An immediate examination of the wreck disclosed the holder with both sections down upon the anchor blocks, and the crown of the inner section introverted on three-quarters of the circle, with the centre down some 2½ feet. The sheets appeared unhurt, but wrinkled, folded, and buckled, the whole resembling the top view of a demolished umbrella. The man-hole plate was removed, and the water level was about 4 feet below the curb. A stream of water was leaking out of one of the bank walls, and a small steam-pump was also removing the water from the tank; and the thermometer was about 20° above zero, with a west wind that cut like a knife. A gang of men were removing the retaining wall at the piers on Georgia Street.

An inquiry into the accident revealed that the tank had been filled with water some days, and the holder had been tested on Friday. It had proved excellently, had been blown out twice or more to work out the air, and the inner section had been elevated nearly or quite to full height. (It is not recollected if the outer section had cupped.) As the holder capacity was much needed, it had been put into regular work by the gas company. Meanwhile, on Saturday, a leakage was observed, which was found to proceed from a crack in the tank at a column foundation near Georgia Street. After its discovery, the crack rapidly opened, and it was decided to pump down the water 5 feet or so (to the level of the streets outside), and a small pump was put on to remove the water. At this juncture it was also decided to discharge the gas once more (as gas was making very fast at the benches) to eliminate the last trace of air from the holder. The inner section was blown off by loosening the man-hole plate, until it rested on the blocks, when the man-hole plate was replaced tightly. All this was done without consultation with the foreman of the ironwork, who had left the holder 8 feet or more out, and going up at four p.m. on Saturday. Having thus arranged the holder, the gas inlet and outlet had been allowed to remain cut off, with the leakage of the tank and the action of the pump (which continued running during the night) until three to four a.m. on Sunday, when the crown collapsed with almost explosive violence. Residents of dwellings 600 to 800 feet distant felt the vibration and shock of the catastrophe.

From the rate of discharge of water from the tank, it is probable that 12 inches to 18 inches of water pressure was accumulated before the crown yielded, and 180 to 270 tons pressure were distributed upon this crown.

The gas was thoroughly displaced when I reached the holder, the cold air outside had descended to the level of the water, and expelled the last trace by diffusion, and an internal inspection with lights was possible. An examination from a float exhibited 13 of the 16 main rafters broken in the middle of their length, at the scarfed joint, where the queen posts attach, the breakage being merely the shearing off of the scarf piece bolts (four ⅝ inch bolts); the parting of all the main tie-rods, either at the king post in the thread portion, or by shearing off the bolt at the gusset next the legs (two of the gussets were torn away from all their bolts); the upsetting, but not shearing off, of all the centre-plate rafter-bolts and the crippling and springing of many, in fact most, of the flat purlins.

The most striking evidence of the force expended was shown at the centre pier. It was a pyramidal pier, 3 feet 6 inches square at the top, and spreading 1½ inch in 12 inches on all sides; not very soundly built, and with mortar scarcely stiffened in its set; but it was massive, and it was capped by a sound block of Medina stone, 3 feet 6 inches square by about 8 inches thick. The stone would be called good building material anywhere. The stone was cracked to small pieces, and the brick pier below it demolished and also crushed, many of the bricks being broken in fragments as well as displaced. The fracture of the pier was diagonal, as the three tie-rods (and rafters), which were uninjured, had dragged over the foot of the king post about 12 inches to one side.

It did not seem that any serious injury had been done to the internal ironwork structure.

Finding so good an appearance within, a new and close examination of the sheets of the crown on the outside was made. Original good iron, the accurate punching of a multiple punch (which punched 60 holes at once, together with accurate laying out of sheets), and the avoidance of any reaming or stretching of holes, when rivetting, had produced so good work that no breakage or injury was apparent. Not a seam showed signs of a crack or opening, and although the buckles were (some of them) 2 feet or more in depth, and very short (5 to 8 feet between crests of the waves), no bent plate could be found. With all this, it is proper to assert that the appearance of the top of the crown to an engineer or practical mechanic, without close examination, was truly hopeless for restoration; and some opinions of very positive character had been given the gas company previous to my arrival in the city.

The result of the examination in my own mind was to advise the pumping out of the tank as quickly as possible, before a snowfall, then to be expected daily, should load the crown, and cause further injury. And after the emptying of the tank to the level of about 1 foot above the anchor-blocks, to enter the holder with a gang of men, have it closed, and blown up with air; and

when the crown should be reverted to its original place by the pressure, to straighten and shore up the rafters one by one; to block up the king post from the centre, and having thus replaced the crown, relieve it of the air pressure, and letting out the gang of men, then proceed at leisure to repair the sheared and broken bolts.

The proposition was at once accepted; but simple as the measure, and perfectly safe the method, it was found nearly impossible to impress either upon the workmen. Divers who were practised in hours of work in the water at the bottom of Lake Erie objected to the risk in this immense reservoir of 130,000 cubic feet of air. Carpenters feared the pressure, although they were assured they might be exposed to greater difference any summer's day. Gas workmen could think of nothing but explosion; and after reasoning with several, the writer found the only alternative was to remain in Buffalo and lead himself.

An examination of the tank showed three cracks from the top of the wall downwards, caused by insufficient backing. Two of these cracks followed the line of junction of column piers, and the third was intermediate (about half way) between the two piers. In accordance with the advice of the writer, the backing at this place was excavated, and the earth removed to the very bottom of the tank wall, and a revetment pier of 8 feet projection and 3 feet width, behind the wall at the base, with a batter of 1½ to 12 towards the tank as it came up, was built. From this revetment pier two wings of brickwork were built to abut the column piers at their groin with the tank wall. From much experience it can be said that the attempt to make a tank wall tight by pointing or grouting a crack is nearly always a failure, and that all efforts short of revetment piers are so nearly direct waste of money, that no engineer is justified in advising them. A further allusion to the tank will be found in the report on the subject to the company, hereafter appended.

Of course, this work of reparation of the tank had to be done under temporary cover, and also, of course, strict regulation was had as to walking on the crown in its precarious state.

The means for supply of air for the proposed operation at the works of the Buffalo Gaslight Company were singularly favourable. The company had been making a partial hydrocarbon gas from anthracite coal and superheated steam, by means of a generator of the type introduced into this country 40 years since by Faber du Faur (which gas was afterwards carburetted by benzine vapour fixed in it by passage through low-heated retorts). The generator was supplied by air by a Blake air-pump, having a capacity of 500 to 600 cubic feet of air per minute, and it was convenient to take the air by a line of 3-inch wrought-iron pipes to the holder; there was an opening on the delivery of the air-pump available for this purpose.

If, however, it had happened that no such supply of air were at hand, it would have been feasible, by means of four to six ordinary smith's bellows and a line of soldered tin pipe, to have air under suitable pressure at the rate of 60 to 90 cubic feet per minute, with, of course, some disadvantage in time. For the engine-pump would lift the holder one foot in 10 minutes, while the suggested bellows would have taken an hour and a half for the same result.

The preliminaries of pipe line, and all other steps essential to the success of the scheme, were effected in readiness.

It was late on Thursday afternoon before the water in the tank was low enough to expose sufficient part of the conical bottom to work upon. At this time the water was 3½ to 4 feet deep at the sides.

There had been taken into the holder and deposited about the centre of the cone, during the day, 30 lengths of hemlock scantling, 3 inches by 6 inches by 22 feet, with other joists and boards for scaffolding, together with a pile of blocking timber, tools, &c.; and at about 8 o'clock, after several callings of the roll, 10 out of 12 men were found.

Some experiments demonstrated that conversation could not be carried on, and a set of signals had been arranged. The order of repetition of raps on the inside of crown was made into a telegraphic communication between the ins and the outs. Of course, it had to be very simple, as the occasion did not demand an extensive code. The inside of the holder was illuminated by 40 or 50 4-inch candles, secured to the rods of the crown by bits of copper wire. After calling roll, everything being ready, the foreman of the gas-works, volunteering to act as outside director, the gang of men descended into the abyss, and the man-hole was bolted down. A little delay ensued by one man's having gone home (near by) to inform his family of his undertaking, and by his declining to join in the risk after his return, and the missing men came to the holder, one joining, and the other, after listening a few moments at the man-hole, and hearing no sound, solemnly pronounced them "all dead," and went his own way, above ground, in fear!

The ladders having been displaced, and the men put in such position that the fall of rods or rafters might not hurt them (only one end of one rod fell down), the proper signal was given, and the pump was started. In about a minute, an evident noise of shaking sheet iron was heard; in five minutes the king post was free from its centre pier, and the resonance of sheets was like distant theatrical thunder. In ten minutes the whole crown was inflated, and in about twelve minutes the outside director signalled that the inner section was 3 inches afloat from the anchor-blocks, and that he had stopped the air-pump, as agreed upon. On the inside, the centre pier was levelled off, and the king post blocked up and wedged, when, at the signal, the air-plug was opened, the holder dropped upon the anchors, and the discharge of air stopped, thus thrusting up the centre, and removing part of the apple shape. (It was supposed, when this was done, that three inches would have been enough, but subsequently it appeared that the holder should have been lifted about nine inches, and then dropped, to have effected the end entirely.)

The thirteen broken-backed rafters were then found to be depressed in their middles (half way from edge to centre) from 2 feet to 3½ feet (except one which was detached from its position, and dropped five or six feet.) The restoration was exceedingly easy, one by one they were quick-shored and spur-shored, by the 22 feet scantling and blocking, offering some resistance and squirming as they passed the toggel line. They were shored up to the apparent proper curve without any attempt at exactness. As the work proceeded, the king post was straightened up, and finally lifted off from its blocking. When this occurred, a signal was made, and the section was raised again, the shores being watched to see that they were not loosened, and four inches of blocking more inserted under the king post, when the section was, by signal, again anchored. After this, some of the rafters had to be further shored up. The whole work of shoring up the 13 rafters occupied four and a half hours.

The work had been done in the night in preference, so as to ensure the undisturbed attention of the external requirements. It was an intensely cold night outside, but a few degrees above zero, and the clear sky gave a radiation through the thin plates of the crown, yet within the holder it was about 40 degrees and only chilly, and at the last smoky from candle smoke, but otherwise not uncomfortable.

At two o'clock in the morning the signal was given, the man-hole was loosened and removed, and the workmen emerged. The exterior of the crown showed that the gradual lifting of the rafters had again elevated the whole roof, leaving the king post still down about 6 inches; and, of course, the sheets were not free from buckles, and the apple shape was very evident. As had been indicated by appearances, the sheets and joints proved unhurt and tight, not a particle of leakage of air having accompanied the raising of the crown, nor did any subsequent defect in this respect develop itself.

Having thus placed the holder in condition to be repaired, the erection of a temporary scaffold near the sides, and the testing and replacing of the injured parts of the internal framing were easy. In fact, a complete restoration was made in less than a week afterwards, at a cost of not to exceed 300 dols. for the ironwork, and the holder was ready for use again by Dec. 20, and was in use on the completion of the tank repairs shortly after. It would be impossible to find any signs of injury from this accident at this time.

After completion of the holder, some questions from the officers of the Buffalo Gaslight Company led to the following report, which is here inserted as a means of conveying some information upon strength of tanks not accessible in similar form elsewhere.

Philadelphia, Jan. 29, 1875.

My dear Sir,—In accordance with your request that "I should write you in full upon the failure of your tank, and state whether the specifications were carried out, and if not, whether that was the cause of the failure," I make the following reply: Referring to the specifications. "The sides of the excavation must be carefully shored to prevent caving; and in case of a slip, the entire mass of broken earth must be removed, and a new fill puddled and rammed in the back of the wall."

The banks were not properly shored—there was a slip—the earth was not replaced by puddling and ramming as prescribed. The prescription of the specification relative to springy bottom was conformed to, and the bottom is consequently tight. "The proper care was not taken in setting out or preserving the location of column foundations, and much additional stonework was needed in the retaining walls to remedy the difficulty.

"There will be laid in each course of mortar on the flat, each ten courses of bricks, three or four strips of hoop iron, 1¼ inch of No. 20 by 8 to 10 feet lengths, the ends overlapping about 2 feet, to make the bond of the wall." This requirement calls for 11 courses of hoop-iron strips, 1¼ inch of No. 20, and 3½ strips to each course; the total weight of iron called for was only 2100 lbs., and the least section of all the bands together at any vertical section of the tank wall would have been equal to 1·69 square inch of solid iron. As expressed in the specification, this iron was only "to make the bond of the wall." It was not supposed to be strong enough to form a hoop and sustain the pressure of water, independent of the strength of the wall as masonry, or of its support by earth backing.

The total pressure of water tending to burst the tank walls at any place was, say, 93 feet 6 inches (or centre of wall) diameter multiplied by 22 feet 8 inches depth of water, multiplied by half the depth of water, multiplied by the weight of a cubic foot of water (62·4 lbs.)=750,000 lbs. (nearly). Now, the foundation of the wall was on solid rock, and the weight of brickwork alone was sufficient to warrant the assumption that no splitting would have occurred at the bottom. And the application of this force of 750,000 lbs. can be taken at the centre of pressure (one-third the depth from the bottom), with the bottom practically unyielding. This assumption is equivalent to the application of 500,000 lbs. uniformly on the sides of the tank.

Hoop iron of No. 20 (·035 inches) thickness has the highest tensile strength allotted to wrought iron; it is hard rolled and nearly unyielding to the point of rupture, and can be fairly assumed at standing a tension of 60,000 lbs. per square inch of section before rupture. Assuming one half this tensile strength, the section of 1·69 square inches gives 50,000 lbs. as absolute strength of the hoops.

The adhesion of mortar to the surface of each hoop is quite equal to its assumed tensile strain. The weakest place in the hoop is, of course, the middle of its length, and it can be estimated as subjected to strain in opposite directions from that point. The sectional area of the hoop equals 1¼ inch by ·035 inch, or ·04375 square inches; multiplying this by 30,000 lbs. tensile strain, and the total tensile strain is found to be 1312 lbs. The surface of either half of a 10-feet strip is 2½ inches by 5 feet = 1·04 square foot, or equal to 1300 lbs. adhesion to each foot of surface of the hoop.

The figures show the strength of the hoop ties, as specified, to have been about one-tenth that needed, if they were to have been the sole reliance against this bursting strain on the walls. The specification requires "that the mortar to be used for bricklaying, concrete, or cementing, must be one part of new hydraulic cement of approved quality, and two parts of sharp sand, and must be used as fast as made; any set mortar must be rejected, and not tempered into new mortar."

The material used to make mortar was not cement at all, but was hydraulic lime. As to the conformity in preparation to the specification, I cannot testify; but from inspection of the crushed centre pier, and at other parts of the work, I can say that the mortar is only a fair building mortar, suited to make joints of brick or stone work of buildings or piers where the usual disproportion of material, as regards loads superimposed upon it, is followed. It did possess a great advantage over common lime for water work, in having a degree of insolubility, and possibly, in the same course of time which is requisite for good quick-lime mortar to become hard in construction above ground, this hydraulic lime mortar may harden under water; but as a mortar to be used in cistern or tank work, having the quality of thick setting and of immediate tensile strength, it by no means satisfies the conditions of the contract.

Unless this deviation from the requirements of the specification was made with the full consent and approval of the gas company, or their engineer, the contractor should be fully held for the consequences. Admitting that the walls of the tank were built of specified thicknesses, and with specified quality of bricks, which, so far as my observation went, were the facts, their strength as masonry, on the supposition that Rosendale cement had been used, can now be properly considered. As in the case of the hoop-bands, the bottom can be taken as unyielding, and the mass of the walls adhering to it as capable of sustaining one-third of the bursting strain, leaving 500,000 lbs. tension as the total load at any vertical section of the tank walls to be resisted. The walls have very nearly 50 square feet of cross section, and the consequent tension per square foot of brickwork is 10,000 lbs. (= 70 lbs. per square inch).

The rupture of a mass of brickwork can be estimated (if perfectly sound and of uniform strength) in either of the two following ways:—

First, on a plane of rupture at the ends of half the bricks, and across (through) the other half. A square foot of cross-section of brickwork (of Buffalo size) is 3 courses wide by 5 courses high, the bricks are 7¾ inches long by 3¾ inches wide by 2 inches thick, thus—

7½ ends to break, 3¾ × 2 = ... 52½ square inches.
7½ „ „ separate at the joint, 3¾ × 2 = . 52½ „ „
Surface of mortar= . . . . . 39 = 144 „

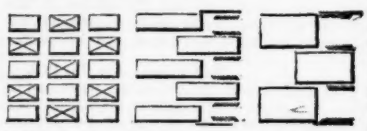
Bricks of low quality have, at least, 150 lbs. tensile strength per square inch (all authorities give 150 to 300 lbs.). The adherence of Rosendale cement mortar to bricks after one month's setting is given by Gilmore to be, *at least*, 12 lbs. per square inch. The tenacity of Rosendale cement mortar laid out of water one month is deduced by Gilmore as fully equal to 50 lbs. per square inch (Grant. Inst. C.E., London, 1865, gives 100 for Portland average of 370 trials), and we have from above—

7½ ends to break = 52½ at 150 = 7875
7½ „ „ = 39 at 12 = 630
Surface of mortar = 39 at 50 = 1950 = 10,475 lbs. per square foot.

For my own part I am decidedly of opinion that the 630 lbs. of adhesion of ends deducted from Gilmore's experiments are not over one-third the real strength (Gilmore's mode of test was very unfair), and I am confident that the least strength of a square foot of solid brickwork in mortar of one part Rosendale cement to two of clear sand is quite 12,000 lbs. per square foot.

The second method of computing the rupture is to assume that it follows the

joint, and does not part any of the bricks which have an average of three times the strength of the mortar.



In the top view, as the wall averaged but 3½ bricks wide, there were but 6 joints for the 7 half bricks, or 2⅔ joints to each foot of width. If the bricks were laid with perfect accuracy, they would have 4 inch laps, but it is fair to take the laps at not over 3 inches in practice, and thus is found:

15 ends of bricks to separate (× 3¾ × 2)	=	105 sq. in. at 12	=	1260 lbs.
Surface of mortar on end section	=	39 " "	50 =	1950 "
5 × 3 × 12 inch flat joints to break	=	180 " "	50 =	9000 "
2¼ × 3 × 12 inch edge " "	=	82 " "	50 =	4100 "
				16,310 lbs.

Either of these computations shows an excess of strength over the requirement, and that, with the hoop iron to prevent check cracks and to strengthen the wall, where the header courses were used, the tank could have carried the weight of water without backing of earth. It was certainly amply strong with he required earthwork or retaining walls to support it. But all this supposition rests upon "hydraulic cement of approved quality," of which I should consider Rosendale as quite low as a standard. I do not believe the hydraulic lime mortar used has, at this time, a tensile strength of 10 lbs. per square inch.

"Behind the walls of the tank there shall be filled in, rammed and puddled, suitable material to form a water-tight solid bank." I saw no ramming—the dumping of loose fill of rubbish into water by no means answered the requirement—the material used, to my view, was not suitable for filling, nor was any water-tight clay used. Considering the mortar employed, and the omission of the hoop-iron ties, the only reliance for the construction was the backing. If the backing had been properly done—according to the specification in all respects—it is my opinion that the defective brickwork would have had adequate support, and no accident would have occurred. It is fair to admit, however, that while I consider the earth backing as equally imperfect with the brick masonry, the ruptures apparent at this time have not happened when earth filling only was prescribed.

"There shall be built on the line of the lot on Court Street and Georgia Street, two retaining walls in stone masonry, each about 32 feet in length (exclusive of wings at either end, which may be needed to hold the bank.) . . . Below level of side-walk, these retaining walls are to have a footing on the natural ground (under soil), and at least 3 feet under side-walk level, which footing shall spread 2 inches in every foot of depth. These retaining walls shall be built up solid against the brick walls of the tank . . . . at the end of the retaining-walls will be required wing walls from 18 inches to 2 feet in thickness, with foundations at least 3 feet below side-walk level, suitably coped. The excavation for these walls will be made to such depth as may be directed by the engineer of gas company," &c., &c.

The immediate cause of the failure of the tank laid in the nonconformity of one of these retaining walls (that on Georgia Street), with the specification as above quoted. (As to the other retaining wall, on Court Street, or the remainder of Georgia Street, I cannot say whether they were improperly constructed or not.) At the wall on Georgia Street, between two of the column piers, the tank wall went out with three cracks, one at each pier, and a third midway between; the cracks opening 1-16th to 1-8th inch at the top, and extending about 12 feet downward.

The examination which followed showed that the wall, in place of having a footing spread two inches in width for each foot of depth below level of side walk, which would have given 3 feet of external batter, had the foundation been carried down to the very bottom of the tank, was founded upon a triangular mass of concrete, which concrete had been substituted for the rammed earth specified to be used in case of a step. In consequence of neglect of the lines, the column foundations of the tank had been twisted about 8 or 10 feet out of proper position, and the retaining wall, which should have been nearly parallel and of equal thickness, had become, say, 3½ to 4 feet wide at one column pier, and 8 to 10 feet wide at the next.

The triangular mass of stonework consequently overhung any foundation or footing at one place 5 or 6 feet, and in no one place had the wall what could be designated as a proper footing, levelled suitably on natural ground, or its specified substitute. On removal of the wall for reconstruction, it was found to have fallen away 2 to 3 inches in the widest places, with a pocket of 12 or 15 feet in length, where the wall had left the brick sides of the tank. This subsidence had evidently occurred whilst the wall was being built, and not afterwards; for the stonework had been gathered over against the tank wall. The retaining wall thus built actually prevented the earth from supporting the sides of the tank, and became a point of weakness instead of strength.

The wing walls were also improperly built; in place of being independent of the retaining walls, they were bonded into them, and the foundations of these wing walls were also tied into the retaining walls. This bonding of walls, where footings do not coincide, is a serious injury to both; there should have been a plumb-joint between the walls. I have enumerated the essential points of deviation by the builder of the tank from the specification, any one of which was fraught with danger to its stability, but the pre-eminent one is, "These retaining walls shall be built up solid against the brick walls of the tank." With the use of inferior mortar, and in the absence of the iron tie-bands, the accident was invited at this point and occurred here.

The specification reads: "The gas company will hold the contractor responsible for the cost of reconstruction, and for damages which may follow, if the workmanship or material does not conform to this specification, whether noticed by the inspector or not; but will assume full responsibility for the tightness of the tank if the work is as specified."

The deviation from the specification in these regards named by me, I believe to have been one and all intentional by the contractor, with full knowledge and assumption of the risk, and they were done for the purpose of reducing (to himself) the cost of the work. In some of the deviations he may possibly have had a colour of permission or direction; but, if so, I am confident such assent or authority was only granted on the assurance by the contractor that the changed construction or material was equally or sufficiently good.

The question of damages resulting to the gas company resolve themselves into several points.

1.—The extra cost of stonework incurred in buttresses because of twisting the column foundations after laying out by the gas company's engineer. This is estimatable by your engineer.

2.—A. The cost of repairing the break, including the pumping out and refilling of the tank, earthwork, stonework, or brickwork, engineering, or other expenses. B. The injury to the holder, which was sucked in by the escape of water from the tank. C. The loss to the company resulting from the supplying of the district from the Buffalo Gas Company.

3.—A. The probable cost, or equitable valuation of cost, of reconstructing the next piece of retaining walls on Georgia Street, where another leak has already developed. B. The probable cost of other reconstruction on Court Street side.

4.—The impaired value of the tank in its present state. This can be made up as follows:—A. The money value of material and workmanship improperly done. The saving on earth work; this value can be made up by your engineer. The saving in mortar and laying; this is also a matter of engineer's estimate for quantity. The saving of hoop iron (about one ton), and the cost of laying it, say 100 dols. B. The consequential injury. Built as your tank has been, I should feel no security that it would remain tight from one week's end to another; by buttressing it, as the broken segment has been buttressed, at each of the eight spaces between columns, it could be made reliable. The cost of constructing this buttress thus becomes a measure of value of reconstruction to make the whole equivalent to its specified construction.

In settling this whole question, if the company feel any especial compassion towards the contractor, possibly they might authorize a settlement which would assume a part of the risk of future failure. It is clear now that one buttress more will be indispensable; how many others may be demanded, or their cost taken as security against further accident, could be determined by the gas company.

The view I have here given will, I am confident, stand the test of legal scrutiny, or of a settlement under an arbitration to engineers. The company had a right to receive as good a tank at the hands of the contractor as the specification described, and I cannot, in the circumstances, see any reason why they should suffer loss when the specification has been departed from.—

Respectfully yours, ROBERT BRIGGS, C.E.

J. M. Vought, Esq., Secretary, Citizens Gas Company, Buffalo.

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

There is very great dulness and apathy of the iron trade here and in other districts—a dulness which rather appears to grow worse than better. Pig iron is hardly so strong, a number of lots having been sold during the week at 1s. under last week's figures. The agents of a north country firm now quote general makers brands at the following approximate figures:—No. 1 foundry, 54s.; No. 2 foundry, 51s. 6d.; No. 3 foundry, 49s.; No. 4 foundry, 48s.; No. 4 forge, grey, 47s.; No. 5 forge, mottled, 47s.; No. 6 forge, white, 46s.; refined metal, 67s.; Kentledge, 57s.; and cinder pig, 39s. to 40s. per ton, on the usual net cash terms. Hematite pig irons are rather irregular just now, a revision of prices having been made during the week by some of the vendors.

I notice that most of the large foundry establishments along the lines of the Midland and South Yorkshire Railway Companies are still doing a fairly large amount of work, the blast furnaces at Sheepbridge, Clay Cross, Staveley, Sheffield, Thorncliffe, &c., being occupied in producing pig to the extent of three to four fifths of their full powers. The Sheffield foundries are for the most part engaged upon machine engineering, or mill castings. Those away from the town, on the other hand, are chiefly employed upon builders castings, colliery ironwork, and tubing, and large gas or water pipes.

The coal trade is hardly so brisk as it often is at this season of the year, but the cold weather of the past few days is operating very strongly in favour of the coalowners. Orders for household coal are beginning to come in very liberally. Steam coal is not officially dearer, but in some instances an advance of 1s. per ton has been resolved upon. An effort is being made by the South Yorkshire steam coalowners to develop Keadby as a shipping port, so as to avoid the cost of sending by railway to Hull, and thus render competition with the northern coalowners more easily possible.

THE LANCASHIRE COAL AND IRON TRADES.

(FROM OUR OWN CORRESPONDENT.)

The shipping trade is a trifle better, so far as the demand for good classes of Lancashire steam fuel is concerned, and for these rather more money can be obtained; but common coal is still very dull, and low prices continue to be quoted.

For gas coal there is a fair inquiry in some quarters, at about 12s. per ton for good screened Wigan coal at the pit; but generally this branch of trade continues dull.

The demand for coke continues very much below the supply, and the small amount of business transacted does not afford any basis for quotations as to the current value of this class of fuel, sellers doing business on the best terms they can obtain.

The iron trade continues in a depressed state, and the transactions during the past week have been to a most limited extent. There is, however, no material change in the quotations for either Lancashire or Middlesbrough brands of pig iron. The demand for finished iron is also dull, and prices are weak.

The local blast furnaces are only working half their plant, and, as the finished iron works are securing very few new orders, there is every prospect of a quiet winter.

THE COAL AND GENERAL TRADE OF THE NORTH OF ENGLAND.

(FROM OUR OWN CORRESPONDENT.)

The long detained fleets of coal-laden sailing vessels got to sea at last. Tuesday saw the Tyne clear of laden vessels, and from the favourable winds which have prevailed since they set sail, nearly all the coasters must have reached their port of discharge. A good stock of coals will thus be secured in the south for a month at least. In the meantime whilst the coasting sailing vessels are thus off making their voyages, very much of the coal-carrying trade will have to be done by steamers, of which there is an ample supply for the purpose. The demand for household and gas coals is little changed from last week. These trades may be termed steady, but there is little speculative business doing at present. The proprietors of gas collieries in Durham, like the owners of steam collieries in Northumberland, have given their workmen the usual fortnight's notice of a reduction of 20 per cent. upon the present rate of wages. The subject is under the consideration of the men, and it will have to be determined, one way or other this week. There is not the least fear of a strike or a stoppage of business, consequent upon these notices having been issued; there is every prospect, indeed, that a mutual understanding will be come to in the gas and steam coal trades between the masters and the men, as to the terms of the proposed reduction. A wretchedly poor business continues to be done in the steam and manufacturing coal trades, which weighs upon the coal trade generally, and except at the gas and household pits, short time is the rule. Several collieries are partially closed, and other pits have been shut up altogether. Under these circumstances men are falling out of employment, and the labour market in the pit districts is overstocked with hands. Second-class coals of all kinds meet a poor sale, and can be bought very low.

The Cleveland iron trade continues in a most depressed condition. Last week No. 3 Cleveland pig was quoted at 49s. per ton, but in some instances could be bought for less. The finished iron works are limiting their operations very considerably, and some of the large concerns in Middlesbrough threaten to stop altogether unless a better business is done shortly. Prices all round are declining, and it is quite clear that wages will have to come down to a much lower level than are paid at present before there can be any great revival in trade.

The general manufacturing trades of the Tyne and neighbouring district are dull and slack of work. The chemical trade is particularly depressed; and the demand for fire-clay goods, which was very active a little more than a month ago, has fallen off considerably lately, and some of the factories are getting dull.

TRADE NOTES FROM SCOTLAND.

(FROM OUR OWN CORRESPONDENT.)

The annual meeting of the new and old directors of the Kilbarchan Gas Company was held on the evening of Monday, the 8th inst.—Mr. Archibald Craig presiding. Mr. Alexander Holmes, jun., was appointed chairman for the ensuing year. In reference to the appointment of manager, a discussion took place as to his duties and responsibilities, and after some discussion it was unanimously resolved to appoint a committee of four directors, who, along with the manager, should have the full powers of the directors in all matters connected with the management of the works, except the appointment of the principal gas-maker. Mr. James Miller was then reappointed manager. The clerk submitted an estimate of the probable income and expenditure for the ensuing year, from which it appeared that the saving on coal alone, as compared with last year, would be £270. Thereafter it was moved and seconded that the price of gas should remain as at present—7s. 1d. per 1000 cubic feet; and an amendment was moved and seconded that the price should be reduced 5d. per 1000 cubic feet. After an animated discussion, the amendment was carried by a large majority.

At the last meeting of the Burgh Commissioners of Broughty Ferry, Mr. W. C. Norrie, convener of the Gas Committee, reported that the average illuminating power of the gas during the past month had been 31·57 candles. It had been stated, he said, that gas of about 27 candles was a better kind of gas, because it gave out less smoke and less sulphurous odour; and he thought it right to let the commissioners know that their manager recommended No. 2 burners as the most suitable for sitting-rooms, and No. 1 burners for bedrooms.

The Dundee Gas Commission is not composed entirely of members of the Town Council, but consists also of representatives of the Chamber of Commerce, the Guildry, and the Nine Trades. The first-named body held their annual meeting a few days ago for the appointment of their five representatives, on which occasion the quality of the gas was again under discussion. One of the speakers said that a few gentlemen had visited the works on Friday week, on which occasion they had seen a test made, the result of which was an illuminating power of above 30 candles, which he considered to be very satisfactory. The average for some time had been about 27 candles, but he knew that from 20 to 40 per cent. actual loss of light occurred in consequence of the pressure being too great or too little for the burners. Another speaker argued that if the testing were done at the works—as was said to be the case—the result would be more satisfactory than if made at some distance from them. One of the members said that if coal did not rise in price there would be a further reduction in the price of gas. Some of the Dundee people are not willing to have it said that the Aberdeen Corporation Gas Commissioners are supplying cheaper gas than is got in Dundee. They affirm that with the discounts allowed the price of Dundee gas is only 4s. 9d. per 1000 cubic feet, and that after next May, when the financial year begins, there will likely be another considerable reduction; whereas the price of Aberdeen gas is about to be reduced to 4s. 10d., and that the financial year in the "granite city" runs from October. It is further stated that for a considerable time the price of gas in Dundee was only 3s. 11d., when it was 5s. and upwards in Aberdeen.

The Greenock Water-Works scheme is making rapid progress towards completion; indeed, it is expected that the new filter will be in use within the next month. The Works Committee of the Burgh Commissioners lately inspected the works, in company of Mr. Copland, the engineer.

It is contemplated by the Paisley Water Commissioners to seek parliamentary powers in the ensuing session for the extension of the Rowbank water scheme, as they desire compulsory powers to supply water to, and to assess the adjacent villages, in the manner that the people of Paisley are at present supplied and assessed.

The water scheme, which has now found favour with a large number of people of Burntisland, is to use the Daur as the source of supply. It is said that at a cost of £16,000, a supply of 70 gallons per head per day may be obtained.

There was another burst on Saturday week in the new water supply-pipe leading from the Loch of Lintrathen to Dundee, the rate of flow at the time being fully 7½ million gallons per day.

At the last monthly meeting of the Town Council of Ayr it was resolved to ask Mr. Gale, C.E., Glasgow, to inspect the Ayr Corporation Water-Works, and report as to additional storeage required, and the general state of the works. The supply of late has been fully 40 gallons per head per day.

Very little spirit or animation is now shown in the Glasgow pig iron market. Prices have fallen to 60s. 6d. and 60s. 4½d. cash, and 60s. 9d. to 60s. 7½d. one month.

The coal trade is very quiet, and, except in house coal, there is very little demand. All other kinds are unchanged in price.

THE FIRE AT THE SOUTH SHIELDS GAS-WORKS.—The fire referred to in our last number was of a much less serious character than was represented. It appears that some tar came over from the sulphate boiler, and as the laths of the roof of the shed caught fire, a few yards of the slates were brought down. Beyond this no damage was done.

SOUTH SHIELDS GAS COMPANY.—An extraordinary meeting of this company was held last week—Mr. R. Wallis in the chair—for the purpose of sanctioning the issue of new ordinary shares authorized by the company's Act of 1867. The chairman said they had met for the purpose of considering the expediency of calling up the remainder of the capital of the company. The estimate of the production of the existing works was one million cubic feet of gas per day, and they were extending. He moved a resolution that the capital of the company be increased by the issue of the remaining 2000 of the new ordinary shares, and that the same be offered to the present shareholders in the company in proportion to the number of old shares now held by them. Mr. Anderson seconded the motion, which was agreed to.

SHREWSBURY PUBLIC LIGHTING.—The Gas Committee of the Shrewsbury Corporation report that during the past year they have given some attention to the public lighting of the borough, and have made several changes, in the hours of lighting and extinguishing the lamps, that they hope will be of benefit. As the gas company contract to supply the public lamps with a flame of a certain character for an average of nine hours a night throughout the year, by lessening the number of hours during the last summer, the lamps will be enabled to be lighted for a longer period during the winter nights. The number of lamps now in the public streets in the borough is 433, being two more than last year. The average illuminating power for the past twelve months has been equal to 16·17 candles. The average illuminating power for the preceding twelve months was 15·03, so that a decided improvement has taken place in the quality of the gas. The pressure has been uniformly good.

LIABILITY FOR PAYMENT OF STAIR GAS IN SCOTLAND.—One day last week James Paterson, formerly residing at 2, Cecil Street, Hillhead, was sued by the proprietor of that building at the Small Debt Court for 9s. 8d., being his proportion of stair gas for season 1874-75, and Sheriff Guthrie decided against him. The *Glasgow Herald* says that considerable diversity of opinion has been expressed as to whether the landlord or occupier is bound to pay for the stair gas in the suburbs, the Police Improvement (Scotland) Act being somewhat indefinite on the point, in contradistinction to the Glasgow Police Act, which distinctly compels the landlord to pay and be responsible for the lighting of the gas in the first instance, but at the same time power is given him under the Act to recover the amount from the tenants, and an allowance is taken off the account by the gas company for his trouble. The Burgh Act, however, says, "The owner or owners shall make provision for lighting such common stair or passage, and for that purpose provide and erect all necessary lamps, and alter, repair, and renew such lamps to the satisfaction of the commissioners;" and further, "If the lamp or lamps is or are not regularly cleaned and lighted (during such hours as are fixed by the commissioners) by the occupier, every such occupier failing to do so, whether under obligation by contract, or in virtue of this provision, shall be liable to a penalty not exceeding 10s. for each offence," leaving it to be inferred that as the occupant is compelled under a penalty to light the gas, he must find the gas to light, the landlord having in the first place complied with the lighting provisions, as narrated above. In giving his decision, the learned sheriff held that, as the defender had lighted the gas he was also bound to pay for it.

LIVERPOOL GAS SUPPLY.—At the meeting of the Liverpool Town Council, on Tuesday last, Alderman Bennett said that at the last meeting of the council it was stated that if the committee had done no other good, they had at least improved the quality of the gas supplied to the town by a certain number of candles. This was nothing more nor less than a charge against the gas company of having been selling by unjust weights and measures; and Mr. King, the engineer to the company, felt very sore that such an unjust and unfounded accusation should be made. It was Mr. King's duty to test the quality of the gas frequently, and they all knew that it was a duty he would perform fairly and honestly, and instead of the charge brought against the gas company being founded on fact it was entirely untrue. The quality of the gas supplied in 1875, was superior in illuminating power to that supplied in 1874. Mr. Bower said he was a member of the committee. He had some reason to believe that there was a great amount of truth in Alderman Bennett's remarks, and at the first meeting of the committee he intended to have the matter cleared up. Alderman Bennett: Then I move the appointment of the committee. The committee was then appointed. The Town-Clerk said the duties of the committee were—1. To consider the advisability of acquiring the undertaking of the Liverpool United Gaslight Company, and to report thereon, and generally upon the whole question of the supply of gas to the public and the corporation, with power to employ such professional and other assistance as they may deem necessary; 2. To take such steps as the committee may deem advisable to protect the gas consumers against being charged, directly or indirectly, with the amount recovered by the Dock Board from the gas company.

The GRAND MEDAL of MERIT at the VIENNA EXHIBITION has been AWARDED to

GWYNNE & BEALE'S PATENT IMPROVED GAS-EXHAUSTERS,

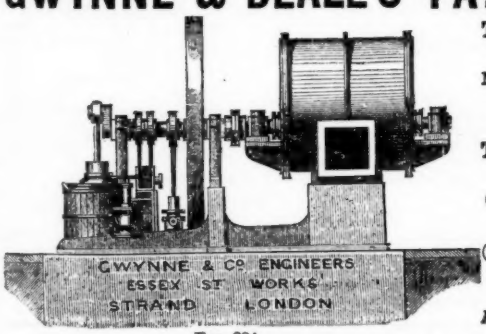


FIG. 224.

The BEST EXHAUSTERS IN THE WORLD.

Made under the personal superintendence of

Mr. BEALE,

The oldest Maker, Inventor and Patentee of

GAS-EXHAUSTING MACHINERY.

(It is NOT CORRECT to state that Mr. BEALE has RETIRED.)

Prices and every information on application.

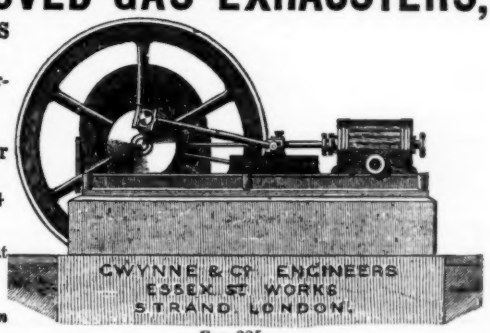


FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 52,500 cubic feet per hour. GWYNNE AND CO. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

REGULATORS, BYE-PASSES, STOP-VALVES, GAS-VALVES, & MACHINERY FOR GAS MANUFACTURE, OF ALL SIZES,

CAN BE HAD ON APPLICATION TO

GWYNNE & CO., HYDRAULIC & GAS ENGINEERS, ESSEX STREET WORKS, STRAND, LONDON, W.C.

G. & Co. are now manufacturing for a London Gas Company three of their 210,000 *cubic feet Patent Gas Exhausters, and many of all sizes.*

WANTED, a good Draughtsman, in a Gasholder and Boiler Works.
Apply to CLAYTON, SON, AND CO., Hunslet, LEEDS.

WANTED, by the Hornsea Gaslight Company, a second-hand 8 or 9 in. GOVERNOR.
Price and particulars to be sent to THOS. WILSON, Manager.

WANTED, a handy Stoker, to take charge of a small Gas-Work. Three retorts working in winter. House and garden. State wages and reference to H. SKOINES, Argyle Street, King's Cross, LONDON.

WANTED, by the Watchet and Williton Gas Company, a steady Man as WORKING MANAGER, who understands the general routine of Gas-Works, and is competent to lay mains and services.
Apply, with references, &c., to W. L. COPP, Secretary of the Watchet and Williton Gas Company, WATCHET.

WANTED, the Management or Assis- tant Management of a Gas-Work. Five years practical experience in the manufacture and distribution of gas.
Address No. 214, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS-WORK MANAGERS.

WANTED, a Working Manager, to take the management of a private Gas-Work. Free house and 24s. per week.
Address (with copies only of references and testimonials) No. 220, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

WANTED, the practical Management of a medium-sized Gas-Work by a Manager of 20 years experience in house fitting, main and service laying, meter work, and retort-setting. Is used to an exhauster. Can carry out any alterations required. Aged 40.
Address No. 221, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Lancashire Gas- Meter Company, Limited, Oldham, a TRAVELLER. They are also open to treat with a Gentleman who has a good connexion amongst Gas Companies for other Apparatus.
Address Mr. H. THOMAS, Lancashire Gas-Meter Company, Limited, OLDHAM.

WORKING MANAGER for a Gas- Works in Sweden required. Should be competent to take the entire superintendence of the works, as well as of the accounts. None but those who can furnish the highest testimonials as to integrity as well as working capacity need apply.
Address, by letter, to MANAGER, care of J. Burbidge and Co., 35A, Moorgate Street, LONDON, E.C.

GAS ENGINEER.

WANTED, a first-class practical Gas ENGINEER, to take charge of the works of the Monte Video Gas Company.
Application to be made, by letter only, with testimonials, and full particulars as to age, former employment, and salary required, to the SECRETARY, Monte Video Gas Company, Limited, 103, Gresham House, Old Broad Street, LONDON, E.C.

FOREMAN WANTED.

WANTED, by a Gas Company, where the make of gas is 160 millions per annum, a practical energetic working man as CARBONIZING FOREMAN. Must hold a similar situation at present, and be able to produce first-class working results.
Address, stating wages required, and all particulars, to No. 217, care of Mr. King, 11, Bolt Court, Fleet Street, LONDON, E.C.

COLLECTOR WANTED.

WANTED immediately, by a provincial Gas Company, a steady, respectable person as COLLECTOR. He will be paid by commission. Must devote the whole of his time to the Company. To enter on his duties immediately. Guarantee security required.
Apply, by letter only, in own handwriting, stating full particulars, age, past and present engagement, to No. 217, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO GAS ENGINEERS AND MANAGERS.

WANTED immediately, a thoroughly qualified Gent'eman to take the entire practical MANAGEMENT of a Gas-Work, in a healthy city of South America, where the make of gas may reach 200 million cubic feet per annum. Salary, with free quarters, from £400 to £600 per annum. One speaking Spanish will be preferred.
Address No. 219, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C., with particulars of experience, &c.

CLERK WANTED, one who has had experience in a gas office preferred, and about 30 years of age.
Address, stating age, salary required, and where at present or last employed, to GEORGE HELPS, Secretary, Bath Gaslight and Coke Company.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of the SHAREHOLDERS in this Company will be held at this Office on FRIDAY, the 19th day of November inst., at Twelve o'clock at noon precisely, when the Directors will apply to the Shareholders—

For authority to raise £500,000 further capital by the creation and issue of new shares.

For authority to convert or consolidate all or any part of the paid-up shares in the capital of the Company into capital stock.

For their approval of "A scheme for the amalgamation of the Imperial Gaslight and Coke Company and the Independent Gaslight and Coke Company, with The Gaslight and Coke Company, in pursuance of sections 18 to 24, inclusive, of 'The City of London Gas Act, 1868,' and of section 56 of 'The Gaslight and Coke Company's Act, 1871.'"

By order,
JOHN ORWELL PHILLIPS, Secretary.
Chief Office, Horseferry Road, Westminster, S.W.,
Nov. 3, 1875.

IMPERIAL GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of the PROPRIETORS and SHAREHOLDERS in this Company will be held at the Company's Office, No. 33, John Street, Bedford Row, London, on Friday, the 19th day of November next, at One o'clock precisely, for the purpose of submitting to them, for their approval at such meeting, "A scheme for the amalgamation of the Imperial Gaslight and Coke Company with The Gaslight and Coke Company (commonly called the Chartered Gas Company) in pursuance of sections 18 to 24, inclusive, of 'The City of London Gas Act, 1868,' and of section 56 of 'The Gaslight and Coke Company's Act, 1871,' and to arrange the remuneration of the Secretary.

By order of the Court of Directors,
HARRY CHUBB, Secretary.
33, John Street, Bedford Row, London, W.C.,
Nov. 3, 1875.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given that (in order to comply with the Company's special ordinance) the ORDINARY HALF-YEARLY MEETING of the SHAREHOLDERS of the above Company will be held at the Offices of the Company, No. 60, Cornhill, in the City of London, on TUESDAY, the 30th day of November inst., at Four o'clock in the afternoon precisely.

The accounts not having been received from Georgetown, this meeting will be only *pro forma*, and will be adjourned to such time in the month of December next as will enable the balance-sheet to be prepared.

By order of the Board,
ALFRED LASS, Secretary.
Offices, 60, Cornhill, London, Nov. 11, 1875.

SOUTH METROPOLITAN GASLIGHT AND COKE COMPANY.

NOTICE is hereby given that an EXTRAORDINARY GENERAL MEETING of the PROPRIETORS of this Company will be held at the London Tavern, Bishopsgate Street, in the City of London, on MONDAY, the 6th day of December next, at Two o'clock in afternoon precisely, to elect a Director in the place of William Baker, Esq., who has resigned.

Any Proprietor holding 40 shares intending to offer himself for election, must give notice in writing at least fourteen days previously to the day of election.

By order of the Board,
GEORGE LIVESEY, Secretary and Engineer.

N.B.—The following clause from the Company's Act of Parliament defines the regulations as to proxies:—

Clause 73. "And be it enacted: That no person shall be entitled to vote as a proxy, unless the instrument appointing such proxy have been transmitted to the Secretary of the Company two days before the holding of the meeting at which such proxy is to be used, and that no person shall at any one meeting represent as proxy more than five shareholders."

589, Old Kent Road, S.E., Nov. 8, 1875.

MEN thoroughly understanding the Proving of Wet and Dry Gas Meters can have immediate employment at the Imperial Meter Company's Works, King's Road, St. Pancras, LONDON.

NEW EDITION, NOW READY,

ADVANTAGES OF GAS FOR COOKING AND HEATING.

By MAGNUS OHREN, A.I.C.E., F.C.S.

For Companies to issue to their Gas Consumers.

Specimen Copy by post Threepence, direct from MAGNUS OHREN, Gas-Works Lower Sydenham, London, S.E.

STATION-METER, second-hand, for SALE, in good condition. Capable of passing 8000 feet per hour, together with bye-pass, valves, and connexions complete. To be sold to make room for a larger one.
Apply to Mr. C. TURNER, Manager, Gas-Works, Ravensthorpe, MIRFIELD.

STATION-METER for Sale, in good condition (Makers West and Gregson) in very ornamental case, fitted up with tell-tales, inlet, outlet, and bye-pass valves, and 12-in. connexions. Passes 25,000 cubic feet per hour. Now replaced with a larger one.
For price, &c., apply to JOHN W. WHITAKER, Manager, Gas-Works, WAKEFIELD.

MESSRS. JOHN BETHELL & CO.,
(ESTABLISHED 1836,)
CONTRACTORS for GAS TAR,
MAKERS OF ANTHRACENE, CREOSOTE, &c.,
CLAYTON CHEMICAL WORKS, MANCHESTER;
SWAN VILLAGE, WEST BROMWICH.
Head Offices: 38, KING WILLIAM STREET, LONDON BRIDGE.

Bray's Patent "Enamel" Regulator Gas-Burners.

The Birmingham and Staffordshire Gas Company do not give Testimonials, but in this case they forward us the following:—

We have used your Regulator Burners for upwards of four years, and are well satisfied with them. We recommend them to all our customers.

SAMUEL WALSH, Secretary.

The Bolton Corporation Gas Department.

The fact that we have used your Burners so long and so extensively is perhaps the best Testimonial I could give of our appreciation of them. When we first used them, I was afraid the tip would not keep secure, and only recommended them for damp situations, such as bleach-works; but finding them as permanent as their rivals, the common Burners, we now use them almost exclusively for all places. For lowness of price, regularity of shape of flame, and for giving full advantage to the gas consumed, I know of no Burner equal to them.

HARRISON VEEVERS.

The York United Gaslight Company.

In reply to your inquiry of yesterday, I have pleasure in stating, from six years use of your Patent "Enamel" Regulators, that, for cheapness, durability, and evenness in shape of flame, coupled with freedom from corrosion in the tips, which in ordinary metal Burners so frequently causes obstructions, they are the best I know of.

We use them almost exclusively, and the York consumers give to them a decided preference.

CHARLES SELLERS, Secretary.

The Liverpool Gas Company,

After a careful examination, are supplying them extensively to their customers, who, they inform us, "give to them a decided preference." They will answer inquiries from parties technically acquainted with the subject.

☞ *The price is little more than common Burners.*

To be had of Dealers in Gas-Fittings throughout the World.

D. BRUCE PEEBLES & CO.,
ENGINEERS,
FOUNTAINBRIDGE WORKS, EDINBURGH,
MANUFACTURERS OF WET AND DRY GAS-METERS;
Patentees and Sole Manufacturers of PEEBLES' LAMP-GOVERNORS,
ABOVE 30,000 OF WHICH ARE NOW IN USE.
"These Lamp-Governors are so superior that they are likely to supplant all others."—*Dr. Wm. Wallace, F.R.S., F.C.S.*
D. BRUCE PEEBLES AND CO. FOUNTAINBRIDGE WORKS, EDINBURGH.

JOHN HALL AND CO., STOURBRIDGE,

Manufacturers of FIRE-BRICKS, LUMPS, TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

JAMES MILNE & SON,

GAS ENGINEERS,

Gas-Meter, Gas Apparatus, and Gas-Fittings Manufacturers,

EDINBURGH, AND

2, KING EDWARD STREET,

NEWGATE STREET, LONDON.

Meter Works in London—2, CROSS STREET, WILDERNESS ROW, E.C.

STATION-METERS, GOVERNORS, CONSUMERS METERS, GAS LUSTRES, CHANDELIERS, BRACKETS, &c.,

And every description of Gas-Fittings and Gas Apparatus.

B. GIBBONS, JUN.,

DIBDALE FIRE-CLAY, BRICK, AND GAS-RETORT WORKS,

STOURBRIDGE (Established 1834),

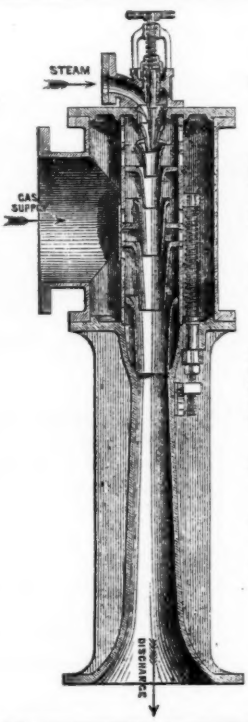
MANUFACTURER OF EVERY DESCRIPTION OF

Burs, Lumps, Stays, Shields & other Bricks, & Gas-Retorts,

A LARGE QUANTITY OF RETORTS ALWAYS IN STOCK.

Circular .	14 in.,	15 in.,	16 in.,	18 in.
Ovals . .	17 in. × 14 in.,	17 in. × 15 in.,	20 in. × 15 in.,	21 in. × 15 in., &c.
D's. . .	14 in. × 14 in.,	15 in. × 12 in.,	15 in. × 13 in.,	17 in. × 14 in., 18 in. × 13 in.
	18 in. × 15 in.,	20 in. × 16 in.,	22 in. × 14 in.,	24 in. × 14 in., 24 in. × 15 in., &c.

Special attention given to the execution of Export Orders.



KÖRTING BROTHERS,

SOLE LICENSEES FOR

W. CLELAND'S PATENT STEAM-JET GAS-EXHAUSTER.

E. KÖRTING'S PATENT

STEAM-JET GAS-EXHAUSTER.

Small Cost—Compactness—Perfectly Self-Acting—
Self-Regulating—Self-Cleansing—No Steam-Engine—No Attention—
No Extra Room Required—No Wear and Tear—No Noise—
No Oscillation in Vacuum, or Back Pressure.

UPWARDS OF 150 IN USE IN CONTINENTAL GAS-WORKS.

IN ENGLAND SUPPLIED TO—

Chartered Gas Co., London; London Gaslight Co., London; South Metropolitan Gas Co., London; Phœnix Gas Co., London; Liverpool Gas Co., Linacre; Corporation Gas-Works, Bolton; Cornholme District Gas-Works; Epsom and Ewell Gas Company; Horsham Gas Company; Gaslight Company, Ipswich; Gaslight and Coke Company, Cheltenham.

E. KÖRTING'S PATENT STEAM-JET REVIVIFYING BLOWERS FOR THE PURIFYING MATERIAL.

W. CLELAND'S PATENT STEAM GAS-SCRUBBER,

Combining small cost and thorough efficiency, with absence of any mechanical means and necessity of renewing the scrubbing material.

For particulars, apply to KÖRTING BROTHERS,
STEAM-JET ENGINEERS,
7, LANCASTER AVENUE, MANCHESTER.
CELLERSTR. 35, HANNOVER, GERMANY.
11, RUE LOUIS-LE-GRAND, PARIS.
1645, NORTH TENTH STREET, PHILADELPHIA, U.S.

KÖRTING BROTHERS,

STEAM-JET GAS-EXHAUSTERS AND REVIVIFYING BLOWERS FOR OXIDE.

LONDON AGENT AND AGENT FOR SOUTH OF ENGLAND:

GERALD J. TUPP, 8, John Street, Adelphi, W.C.,

To whom all inquiries for these districts should be addressed.

DEMPSTER, MOORE, & CO., 49, ROBERTSON ST., GLASGOW,

SOLE AGENTS IN SCOTLAND FOR KÖRTING BROTHERS.

WANTED, GAS-WORKS TO LEASE.

THE Engineer of a Work of acknowledged repute is desirous of LEASING a small work. Can offer unusual advantages to companies or proprietors whose undertakings are unremunerative, or have fallen into a dilapidated condition.

Address No. 202, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CHIEF ACCOUNTANT.

THE Bombay Gas Company, Limited, require the services of a gentleman to proceed to Bombay as CHIEF ACCOUNTANT. Salary £500 per annum, including house, horse and carriage allowance, with £12 10s. per annum for every one-quarter per cent. dividend paid above 7 per cent. per annum (the Company are now paying 7½ per cent.). Passage paid out, and home at termination of the agreement. Engagement for not less than six years, terminable on six months notice by the Company. Those gentlemen will be preferred who thoroughly understand gas accounts, and whose age is about 25 and not exceeding 35.

Applicants to state whether single or married, and what family. Unexceptionable references, and security for fidelity required to the extent of £1000, the Company paying the premium.

Apply, by letter only, endorsed "Application for Accountant," to the SECRETARY, 4, Great Winchester Street, LONDON, on or before the 4th proximo.

GAS-WORKS TO BE LET.

TO BE LET, on Lease, for a term of years, the Lower Gornall Gas-Works, Staffordshire.

The works are situated in a very populous neighbourhood, are fitted up with every requisite, are in full operation, and the make of gas and the number of consumers are steadily increasing.

Possession may be had on the 1st of January next, when the present lessee's term expires.

Apply to Mr. F. KENNING, Secretary, District Gaslight Company, Limited, 21, Darlington Street, WOLVERHAMPTON.

STATION-METER FOR SALE.

THE Directors of the Dudley Gas Company having erected a new Meter at their works, have one of 8000 cubic feet per hour capacity, in good condition, to dispose of, with 10-in. hydraulic valves and bye-pass connexions.

An offer is solicited, as the house it occupies must come down.

Gas-Works, Dudley, Nov. 10, 1875.

GAS-WORKS FOR SALE.

THE Proprietors are prepared to receive OFFERS for the Wymeswold GAS-WORKS.

The works consist of Retort-House, with a bench of two and a setting of one retort, coal store, a comfortable foreman's house, meter-house, and store shed, together with retort-fittings, condenser, scrubber, two purifiers, meter, governor, and gasholder to contain 5000 cubic feet, or thereabouts, as well as the whole of the mains through the village.

The works are of recent date, in good condition, and are well situated.

The gas and meter rental amount to about £300 per annum, and the consumers are steadily on the increase.

Further particulars to be obtained of Mr. J. B. BALL, Gas-Works, LOUGHBOROUGH.

TO MANUFACTURING CHEMISTS AND OTHERS.

THE Directors of the Rochester, Chatham, and Strood Gaslight Company are prepared to receive TENDERS for the purchase of their surplus TAR and AMMONIACAL LIQUOR for the year 1876 (Jan. 1 to Dec. 31).

The quantity of Tar will be about 150,000 gallons, of Liquor about 500,000 gallons.

The Tar and Liquor can be delivered into tank barges at the works at Rochester, and at Gillingham.

Tenders may be made for Tar and Liquor, separately or together.

Further particulars may be known by application at the Office, 56, High Street, Rochester.

Tenders, marked "Tender for Tar and Liquor," must be at the Office on or before Wednesday, the 1st of December.

The Directors reserve the right to reject any or the whole of the tenders.

By order,
W. SYMS, Secretary.

Rochester, Nov. 11, 1875.

T. NEWBIGGING,

CONSULTING GAS ENGINEER,

ECCLES, MANCHESTER.

HENRY LYON,

CONSULTING GAS ENGINEER,

BROOKLYN, CHEETHAM HILL ROAD,
MANCHESTER.

Twenty-three years at the Rochdale Road Works.

D. M. NELSON,

48, GORDON STREET (late 135, BUCHANAN ST.), GLASGOW,

Supplies every requisite in connexion with the distribution of Gas and Water.

Estimates and prices on application.
WOOD GRIDS for Purifiers and Scrubbers.
Cast-Iron PIPES and VALVES.
Street LAMP-PILLARS.
Patent Pipe SCREWING-MACHINES, &c.

PATENT FUEL AND LIME FOR PURIFYING FROM FOUL LIME.

By a simple process the Foul Lime is converted into Fuel, by the combustion of which the lime is reproduced as a purifying agent.

Licences to work the invention will be granted to Gas Companies on very reasonable terms.

For further particulars apply to Mr. E. MADDOCKS, Manager of the Gas-Works, KETTERING.

The adoption of the above invention, without a licence from the Patentee, will be an infringement of the patent, and will subject the person or company guilty of such infringement to legal process.

WEST'S GAS IMPROVEMENT COMPANY,

LIMITED.

DIRECTORS.

AMBROSE WARDE, Esq., West Farleigh, Kent, Chairman.
CHARLES ARKCOLL, Esq., J.P., Maidstone, Kent.
GEORGE EDMETT, Esq., J.P., Maidstone, Kent.
RICHARD MORRIS, Esq., J.P., Doncaster.
JONATHAN HARRISON, Jun., Esq., Brandes-Burton, Hull.

MANAGING DIRECTOR—JOHN WEST, Esq., Maidstone.

CONSULTING ENGINEER—R. P. SPICE, Esq., M. Inst. C.E., 21, Parliament Street, London, S.W.

ENGINEER AND ANALYST—F. W. HARTLEY, Esq., A. Inst. C.E., 55, Millbank Street, London, S.W.

BANKERS—LONDON AND COUNTY BANK, Maidstone.

THE COMPANY ARE NOW PREPARED TO SUPPLY AND ERECT THEIR PATENTED MACHINERY FOR

CHARGING AND DRAWING GAS-RETORTS,

And to enter into arrangements with GAS COMPANIES for its use upon moderate terms of Royalty.

The Patented Machinery has secured the approbation of all Engineers who have visited the MAIDSTONE GAS-WORKS, *where it is in full operation, and may be inspected at any time on application to the Manager.*

The advantages attending its use are—

INCREASED VOLUME OF GAS PER TON.
INCREASED YIELD PER RETORT.
INCREASED BULK OF COKE FOR SALE.
REDUCTION IN LABOUR AND LESS DEPENDENCE ON SKILLED STOKERS.

A Pamphlet containing a description of the Machinery, and Copies of Reports on the working of the same, &c., will be forwarded on application to the MANAGING DIRECTOR, Maidstone. Communications may also be addressed to R. P. SPICE, Esq., or to F. W. HARTLEY, Esq.

EXTRACTS FROM REPORTS.

MAIDSTONE GAS COMPANY, Aug. 31, 1875.

"It was a fortunate circumstance that the company had the benefit of this Apparatus, for during a portion of the year there was great difficulty about coals, and it was even impossible at one time to obtain the kind of coal contracted for. The new Apparatus facilitated the distillation of coals, which without it would probably have produced an inferior yield of gas.

"The directors have twice in the past year found themselves in the satisfactory position of being able to reduce the price of gas."

Messrs. LIVESEY and WOODALL, Aug. 28, 1873.

"The little waggon containing the charge, which is propelled into the retort, deposits the coal in a perfectly even layer upon the bottom of the retort, and that in a shorter time than is occupied when two scoops are used for the same purpose. The perfectly level surface of the resulting coke permits the use of an ingenious rake, designed by Mr. West, by which the whole charge is completely withdrawn in one motion. By the use of this Apparatus the labour required in carbonizing is reduced from 8 to 10 per cent. per ton of coal, and is also of a less exhaustive character for the stokers."

F. W. HARTLEY, Esq., A. Inst. C.E., Sept. 5, 1875.

"Any company working on Mr. West's system would be much less dependent than is the usual case on the assistance of skilled stokers, inasmuch as men who had never charged a retort in their lives could after a very few trials charge and draw retorts perfectly, and would be able to continue the work from the absence of anything like the tax on their physical powers which the system of scoop or shovel charging and rake-drawing involves, and there would be moreover a considerable saving in the cost of labour, inasmuch as a gang of men would certainly be able to attend to a greater number of retorts.

"In respect to cost of wear and tear of retorts and the charging and drawing appliances, there is, in my opinion, no reason to believe that it will be greater than with the old system, but on the contrary that it will be reduced.

"If the system be properly applied, considerable advantages must accrue to the companies who work with it."

R. P. SPICE, Esq., M. Inst. C.E., Oct. 12, 1875.

"And finally, as to the quantity of gas produced and its quality; the improved results are such as all rational, well-informed men would expect from working off charges of coal deposited *evenly* and in a *thin layer* on the bottom of the retort, in two-thirds the time requisite to carbonize the same quantity laid in a thick mass, not evenly or uniformly deposited; and briefly, those which I found were 10,300 feet of 16-candle gas obtained from Holmside coals.

"I will only add that I shall certainly take the earliest opportunity I may have of giving practical proof of my good opinion of the invention, by introducing it in the course of my practice, and heartily wish the inventor and the shareholders in the undertaking great success, which I consider they richly deserve."

C. & W. WALKER,
8, FINSBURY CIRCUS,
LONDON, E.C.

MANN & WALKERS' PATENT SCRUBBER.

By Letters Patent in Great Britain, Europe, and the United States of America.

The improvements made during the past three or four years in all the parts of the internal and external construction and machinery of these Scrubbers have rendered them perfect for their work of purification with all kinds of coal, and their cost is less than any other method of completely purifying gas from ammonia.

They contain their own motive power, requiring only a small inappreciable quantity of steam from the gas-works boiler, and are then complete in themselves, ready for service.

They are, in all cases, constructed under guarantees to perfectly perform their work. They are now extensively used in the largest gas-works of London and the chief cities of Europe, **nearly one hundred being in use,** and their perfect efficiency and profit to a gas company have been fully established with every variety of coal used in Europe. References can be given to the largest gas-works in Europe.

By their use the department of purification from ammonia upon a gas-works is made complete, without the aid of prepared oxide of iron, chemicals in purifiers, or any other supplementary process, and the whole ammoniacal residual product contained in the coal is absorbed and obtained in the form most profitable to a gas company, while the requirements of all Acts of Parliament and of the Board of Trade, relating to incorporate gas companies, are satisfied.

Foul Gas, properly condensed, entering the inlet is, by once only passing through the Scrubber, completely purified from ammonia with regular certainty day by day, without any further trouble, or any other process, effected by a very small quantity of clear water let into the machinery room at the top of the Scrubber, which is discharged at the liquor outlet at the bottom, from Newcastle coal at about 18 to 20 ounces strength, from Yorkshire and other coals generally from 25 to 30 ounces strength; while acidulated litmus or turmeric exposed at the Scrubber outlet will not show the slightest discoloration, and there is not a quarter of a grain of ammonia per 100 feet left unabsorbed.

Applications relating to dimensions and prices should be addressed to us, C. AND W. WALKER, 8, FINSBURY CIRCUS, LONDON, E.C., or to Mr. WILLIAM MANN, late Superintendent of the Chartered Gas-Works, BLACKFRIARS, LONDON; they should state approximately the largest make of gas in 24 hours on a winter's day, and the smallest make on a summer's day, to be purified.

WATER-MAINS.

COTTERILL'S PATENT STEEL TUBE-DRILLS, for connecting services to water-mains, *under pressure*, without turning off the water. They drill and tap themselves, and are left in the mains. Made of all sizes, from ¾ to 2 inches and upwards. They cost less than the ordinary plan.

Apply to CHARLES FORSTER COTTERILL, Cannock, STAFFORD, Patentee.

BIRTLEY IRON WORKS,
CHESTER-LE-STREET,
DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

Warehouse in London for Cast-Iron Pipes and Connexions of all sizes and in any quantity, Scott's Wharf, Bankside, Southwark.

Agent in London, Mr. J. MANWARING, 101 Cannon Street, E.C.

IN THE MATTER OF BRONNER'S PATENT BURNERS.

NOTICE is Hereby Given that Julius Brönner, on the 20th of April, 1875, in a suit in Chancery, 1874, B 365, obtained an injunction perpetually restraining the Defendant, his Agents, Servants, and Workmen, from in any way advertising or offering for sale, or selling, or from in any manner causing to be advertised, or offered for sale, or sold as "Real Brönner," or "Brönner," or "Broehner" Burners, any Burner not manufactured by or for the Plaintiff, Julius Brönner, or by his Agents.

JACKSON, FOX, AND ELLEN,
55, Chancery Lane, London,
Solicitors for the Plaintiff,
JULIUS BRÖNNER, Frankfort-on-Maine.

JAMES OAKES & CO.,
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WENLOCK IRON WHARF, 21 & 22, WHARF ROAD,
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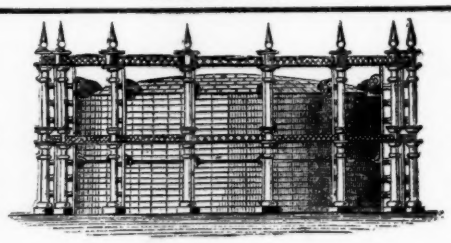

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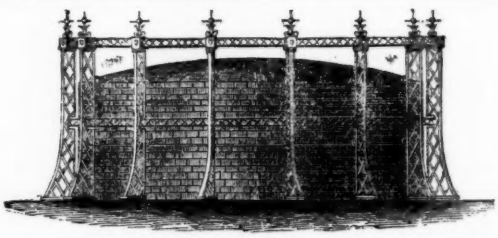

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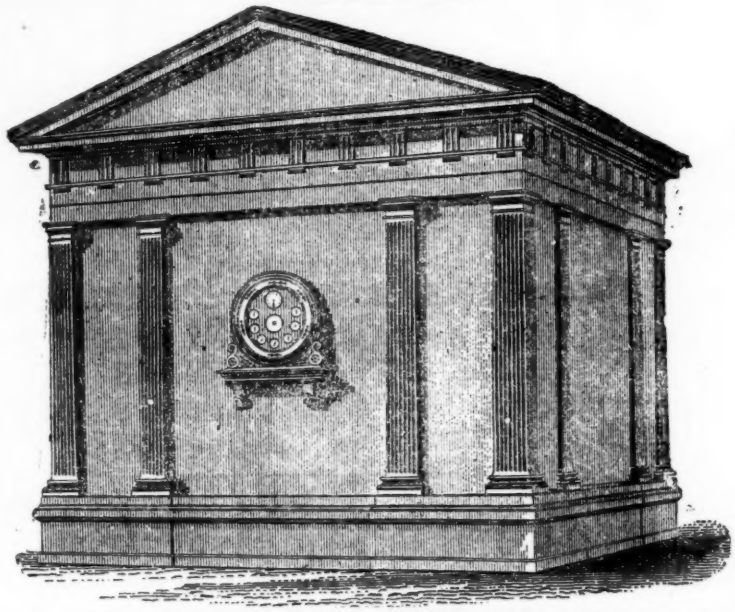

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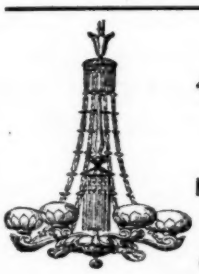

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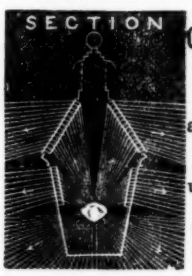

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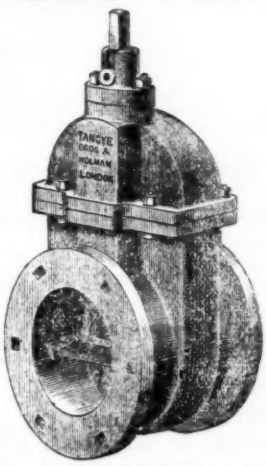

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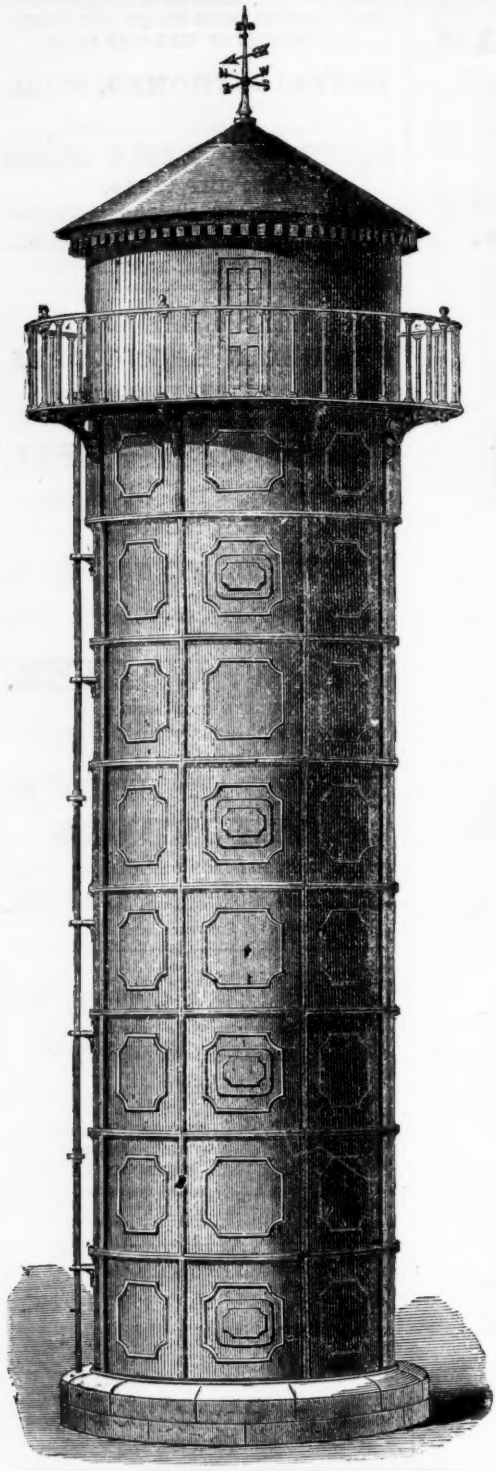

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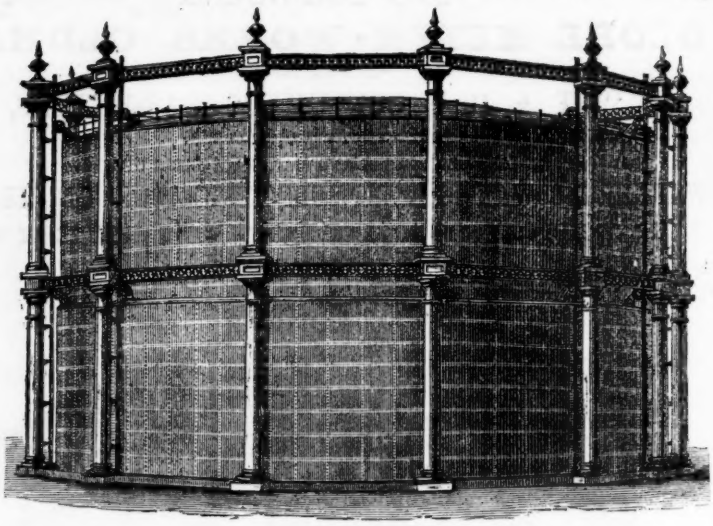

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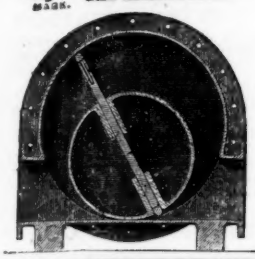

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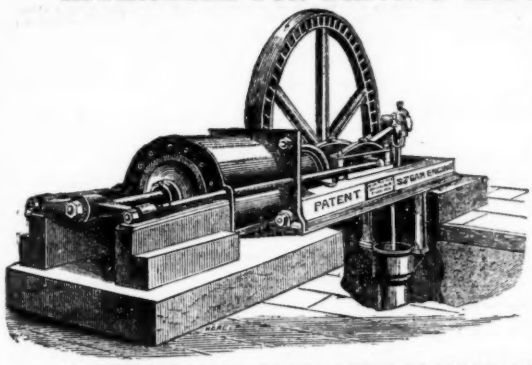

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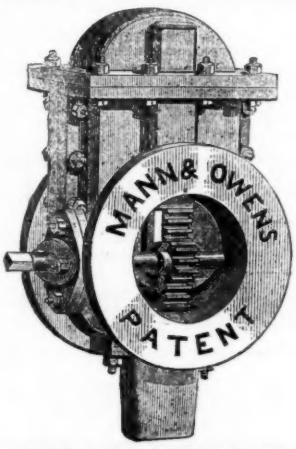
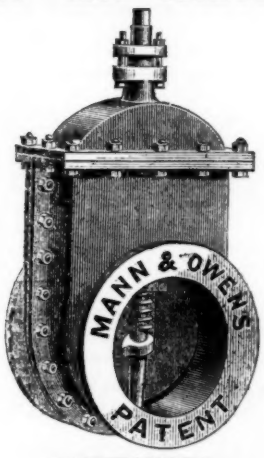


RACK AND PINION VALVE.



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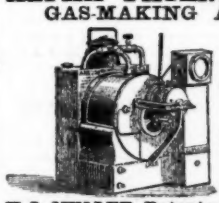

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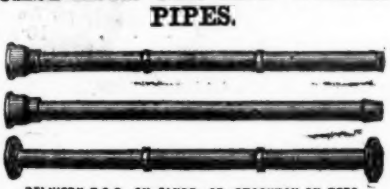

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PRESENT PRICE:

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8s. 9d. ,, F.O.B.

Cubic Feet.	Illuminating Power.	Coke (sup. qual.).
10,000 ..	20 candles. ..	12 cwt.

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This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

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STRONGLY RECOMMEND A TRIAL OF THEIR

CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·0	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

These Nuts are extensively used by various Gas Companies throughout the Kingdom, who bear strong testimony to their value.

APPLICATIONS FOR PRICES, &c., TO BE SENT DIRECT TO THE COLLIERY, AS ABOVE.

GAS PURIFICATION & CHEMICAL Co., LIMITED,

(Successors to JOHN WILLIAM O'NEILL & CO.,)

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The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.

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THE DERBYSHIRE

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GAS COAL

Of superior quality, delivered at any station in England and Wales.

Purified gas per ton of coal in cubic feet (average)	10,775
Weight of coke in lbs. per ton of coal	1,465

ANALYSIS AND PRICES ON APPLICATION TO

Mr. EDMUND TAYLOR, Secretary,

ALBERT COLLIERY, NEWBOLD, NEAR CHESTERFIELD.

THE LOCHORE AND CAPLEDRAE CANNEL COAL COMPANY, LIMITED.

Works: LOCHORE by LOCHGELLY, FIFESHIRE. Office: 19, MAITLAND STREET, EDINBURGH.

This Company request attention to the very superior quality of their Cannel Coals.

1. The following are the practical results given by Dr. Wallace, of Glasgow, of analyses of their Lochore and Capledrae Cannels:—

	Sample worked at Capledrae.		Sample worked at Lochore
Gas per ton of coal, at 60° Fahr. and 30 inches barometric pressure . .	13,095 cubic feet.	..	11,760 cubic feet.
Illuminating power, in standard sperm candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	32·91	..	34·83
Value of 1 cubic foot of gas in grains of sperm	780	..	836
Equivalent of a ton of coal in pounds of sperm candles	1,459	..	1,404
Durability of 1 cubic foot by 5-inch flame	69 minutes.	..	71 minutes.
Gravity of the gas (air = 1000)	596	..	594

Remarks.—This (the sample from Capledrae) is a Cannel Coal of first-class quality, giving 13,000 feet of 33-candle gas. It contains only a minute proportion of sulphur, and the ash is almost quite white. The coke is of rather inferior quality.

Remarks on Sample from Lochore.—This is a Cannel Coal of first-class quality, giving a large yield of very rich gas and a coke of medium quality.

2. The following are the practical results of analyses by Dr. Wallace of the Company's Waverley Cannels:—

	Capledrae Waverley.		Lochore Waverley.
Gas per ton of coal, at 60° Fahr. and 30 inches barometer	9,120 cubic feet.	..	11,145 cubic feet.
Illuminating power, in standard candles, by union jet consuming 5 cubic feet per hour, at ·5-inch pressure	36·62	..	33·09
Value of 1 cubic foot of gas in grains of sperm	878	..	794
Equivalent of a ton of coal in pounds of sperm candles	1,145	..	1,264
Durability of 1 cubic foot of gas by 5-inch flame	80 minutes.	..	67 minutes.
Gravity of the gas (air = 1000)	677	..	597

Remarks on the Sample of Capledrae Waverley.—This Coal gives fully 9000 feet of gas of 36½ candles, and is admirably adapted for bringing up the quality of gas made from common coal or inferior qualities of cannel. The tests were made at a rather high temperature, this being one of the coals that stand a very high heat without serious diminution of the illuminating power of the gas The coke contains 60 per cent. of ash, and is therefore almost valueless, but the proportion of sulphur is very moderate.

Remarks on the Lochore Waverley.—This is a first-class Cannel Coal, giving 11,000 cubic feet of 33-candle gas. The quantity of sulphur is very minute, and the ash is nearly white. The coke is of inferior quality, but not wholly valueless.

Applications for full Copies of Analyses and Prices may be made to the Company, at

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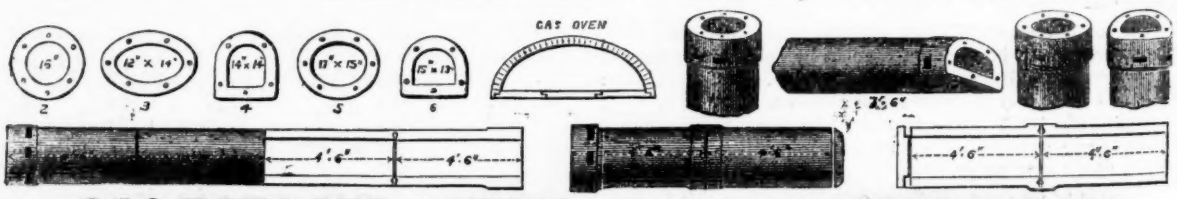

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